THE

MECHANICS' MAGAZINE,

MUSEUM,

Register, Journal,

AND

GAZETTE,

JUNE 6th, 1840—DECEMBER 26th, 1840.

VOL. XXXIII.

"If each man but invented for himself, unnecessary labour would be multiplied to infinity, and the inventive faculty be robbed of its highest value—that of continual encrease."—HERDER.

LONDON:

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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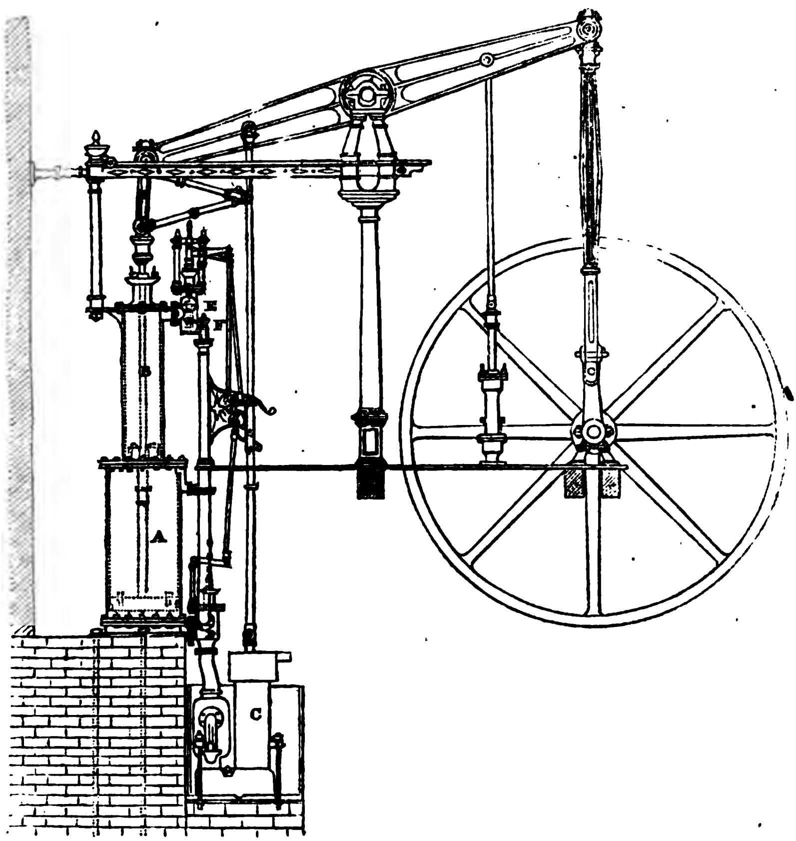
MR. SIMS'S IMPROVED CORNISH STEAM ENGINE.

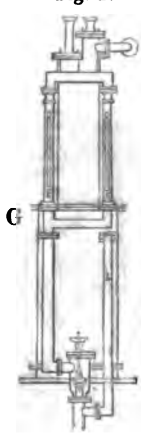


MR. SIMS'S DOUBLE PISTON EXPANSION STEAM ENGINE.

Sir,—Agreeably to my promise I beg to hand you a sketch and description of my new expansion steam steam engine.

That the Cornish steam engines are superior to any other steam engines is a fact so generally known, that I consider it quite unnecessary to enter into any explanation or furnish any further proof of its superiority. Therefore, I would merely say that the proper application of the steam case or jacket, the covering the boilers, cylinders, steam pipes, &c. with proper nonconductors of heat, and working on the expansion principle, have been the most prominent causes of the improved duty. But although the duty has reached to an almost astonishing height, there was still room left for further improvement, and now I have much pleasure in informing the country that I have effected a further saving to a great amount. The plan of engine which I have adopted, and which I have at work is shown, by the accompanying figures, and is contrived in the manner I have represented in order to carry the expansion principle to its fullest extent of usefulness. It will be seen that I have succeeded in a very simple manner, inasmuch as the engine is not in the smallest degree more complicated than the common single power engine, except in having an extra cylinder with piston and rod. Having a desire to illustrate this engine in such a manner, that every one may understand the mode I have adopted, I would beg to draw their attention to the fact, that in all engines (but I would more particularly allude to single power engines,) at the extent of the down stroke of the piston there is a cylinder full of steam of a pressure in proportion to the load of engine and rate of expansion. This steam, of course passes off to the condenser every stroke the engine makes, and is consequently rendered useless for the further working of the engine. In order to render this steam useful, I have invented the present plan, it being the most simple and effectual mode of working the steam as long as it can be made available, and for carrying the expansion principle to its fullest extent. It is, in fact, merely an engine working with a cylinder of double the length generally used and with two pistons instead of one. This engine makes a double power engine of single power steam—works with the greatest regularity of motion,—and by means of the bottom piston having an available area of three times that of the top piston, gives a power below equal to the power above, and with steam, which in other engines is thrown away. There is also another important feature in this engine, which is that, although the power is doubled by merely placing a large cylinder below the small cylinder (the expense of which is trifling,) there is no more boiler room or weight of boilers required, and no more steam than is used for a single power engine.

Fig. 2.



I have as yet only one pumping engine of this kind at work, the duty of which is given in Lean's printed monthly reports for the last three months. I am sorry to say that it is working under unfavourable circumstances, the average number of strokes per minute being only 3.18—the water in the mine not at present requiring a greater speed; but on comparing the duty for the above time with a single power pumping engine of the same size, and working under the best circumstances, I find the duty to be as 53 to 67, or about 27 per cent. in favour of the new engine.

I have also a rotary engine of this kind at work, which will soon appear in the report; its performance is highly satisfactory, so much so, that I can safely guarantee a saving of full 50 per cent. over any of Bolton and Watt's double acting engines not working on the expansion principle.

I consider it unnecessary to enter further into this subject at present. I will therefore only say, that if any of your readers should entertain any doubt respecting the facts I have stated, I will be most happy to show them the engines and prove to them the correctness of what I have stated.

I am, your obedient servant,

James Sims.

Description of the Engravings.

Figure 1 (front page.) A. The large cylinder; B, small cylinders; C, condensing work; D, exhausting nozzle; E, valve for the admission of steam from boiler to top of small piston; F, valve for the admission of steam from top of small piston to bottom of large piston.

Fig. 2 shows the arrangement of pipes and nozzles; G, G, side pipes for the conveyance of steam from the *t*op of small piston to the bottom of large piston, and to which the working gear is fixed; H, pipe from top of large cylinder to eduction pipe for the purpose of keeping a constant vacuum between the two pistons.

ON THE ALLEGED INHERENT ACTIVITY OF THE PARTICLES OF MATTER—MR. WIGNEY IN ANSWER TO MR. PRATER.

Sir,—I have carefully read the article in number 870, page 509, volume xxxii, of your work,—"On inherent activity, as a property of the particles of matter, unrestrained by cohesion atmospheric pressure, or other forces—Demonstrations that this property is adequate to the explanation of the diffusive power of gases; by Horatio Prater, Esq.," and as it appears to me to be full of error, and of fallacious evidence adduced in support of the theory advanced, and that too upon a subject, which I conceive to be the elementary basis of every scientific enquiry, I cannot refrain from an endeavour to refute the opinions which he has so industriously essayed to inculcate.

But in order to accomplish this, it appears to me to be first necessary to furnish a correct atomic theory, and this I conceive I have already done in your xxx and xxxi volumes; and as repetition in this instance may be better than reference, I will again furnish it with as much brevity as possible; after which I shall endeavour by that theory, to prove the erroneous conclusions urged in Mr. Prater's paper.

The leading features of my theory are these:—That all substances are composed of indestructible material atoms—that such atoms are divisible into distinct classes or species, as for instance; oxygen, hydrogen, nitrogen, carbon, caloric, light, &c.—That the first four of those classes or species enumerated, are subject to the law of gravity, and therefore may be termed ponderable, *and that they possess no inherent power of activity as opposed to gravity.*—That the two latter enumerated classes or species, are not subject to the law of gravity as relates to the action of the earth, but are so as relates to the action of the sun, and that consequently they are subject to what may be termed the power of recession from the earth, and therefore may be donominated imponderable—that the form of atoms are spherical—that the ponderable atoms are of greater magnitude than the imponderable—that the imponderable are smaller than the instertices presented by the union of the ponderable atoms when in close contact, and are therefore enabled to permeate solid bodies—that all substances, whether solid, fluid or gaseous, are compounded of two or more of the classes or species of ponderable atoms, and of the two enumerated imponderable classes or species—That all bodies or substances in an integral state, are compounded of a definite amount of the several classes or species of ponderable atoms, and an indefinite amount of the imponderable, to constitute a peculiar body or substance—That the imponderable atoms are subject to transition from and to bodies or substances to a limited extent, without such bodies or substances being partially or totally decomposed, and that the imponderable atoms subject to such transition, may be, and are termed active while those which are not subject to such transition, without a partial or total decomposition of the body or substance, may be and are termed latent—that all ponderable atoms are subject to the law of gravity as a primary law; to affinity as a secondary law; to simple attraction, attraction of aggregation and attraction of cohesion as (modifications of) a tertiary law—that the imponderable atoms of caloric are subject to the law of equal diffusion as a

primary law, and to recession from the earth as a secondary law and that both these laws are superior in power to the laws, to which the ponderable atoms are subject—that the specific gravity of solid bodies or substances, is proportionate to the amount of ponderable atoms, and their organic arrangement—that the specific gravity of fluids and gases are propotionate to the relative constituent amounts of their ponderable and imponderable atoms; and finally that the expansion (*diffusion*) or contraction of gases, is alone atributable to the impartation thereto or abstraction therefrom of caloric.

Having furnished the outlines of the theory which I advocate, I will now proceed *seriatim*, to offer a few observations on the several illustrative cases, which Mr. Prater has selected to endeavour to prove the correctness of his very opposite theory.

The *first* example Mr. Prater furnishes in support of his theory, is, "that the particles of almost any powder when mixed with water in which they are insoluble, are in a state of constant motion; I have observed such motion when a little finely powdered chalk is diffused through a small quantity of water."

It is well known to all chemists, that water (except distilled water) possesses some adventitious substances blended with it in a state of chemical solution; and hence between any solid reduced to powder and diffused throughout such water and such adventitious substances in solution contained in that water, there most probably will be a chemical action, causing a partial decomposition of each and the creation of a new compound: thus if the water contains any acid, and that species of chalk called carbonate of lime is introduced, the affinity existing between the oxygen of the acid, and the carbon of the chalk will prompt their union, while the power of attraction will effect the consummation, and carbonic acid will be the resulting product; an effect which cannot be produced without the motion of the ponderable atoms of the oxygen contained in the water, and the carbon contained in the chalk. If Mr. Prater meant to convey the opinion, that the power of affinity and attraction, will under some circumstances prove superior to the power of gravitation, then I conceive that he would be right; but if I understand him correctly, his object is to endeavour to prove the fallacy of the doctrine of the "*vis inertiæ of matter;*" and I think if he were to proceed with the investigation of the experiment, he would find, upon the cessation of the intestinal motion produced by the combination of the oxygen and the carbon in obedience to the laws of affinity and attraction, and the re-active force expended upon the chalk, that both the residue of the chalk and the newly created carbonic acid, will gradually fall to the bottom of the vessel in obedience to the law of gravity, unless any portion of such carbonic acid should be converted into gas, by the combination therewith of a sufficient quantity of the imponderable atoms of caloric. The carbonic acid gas being of less specific gravity than the fluid in which it is generated, would rise to the surface of such fluid, and prove another cause of motion by its ascent, and being also of less specific gravity than the superincumbent atmosphere, it would finally escape from the fluid by evolation. But neither the intestinal motion, nor the evolation, prove the fallacy of the doctrine of the *vis inertiæ* of matter, but merely, that as the power of gravity diminishes in the inverse ratio of the square of the distance of the substance or atom under its influence from the earth, and as the power of attraction diminishes also, so if a substance or atom, is placed at a less proportionate distance within the sphere of attraction, than is the same substance or atom within the sphere of gravitation, then will that substance or atom move in the line of attraction instead of gravitation; but still it must be remembered, that the sphere of gravitation is far more extensive and its power more comprehensive, than the sphere and power of attraction. In relation to this example, it may also be observed, that if chalk, termed sulphate of lime, is introduced into water containing carbon, the same effect will be produced, the acid of the chalk furnishing oxygen to combine with the carbon contained in the water.

The *second* example which Mr. Prater adduces, is the evaporation of water, at the ordinary temperature of the atmosphere.

The evaporation of water is the result

of the combination of a larger amount of the imponderable atoms of caloric with the ponderable atoms of oxygen and hydrogen of which the water is composed, than is sufficient to maintain its integral existence as a fluid, whereby, the ponderable atoms constituting their relative portion of the upper surface of that fluid, are separated, from each other to a greater extent by the intervening presence of the imparted caloric, and as the imparted and original atoms are together of less specific gravity than the superincumbent atmosphere, the new created compound, termed vapour, evolutes from the fluid, and rises in the atmosphere. This impartation of caloric is the result of the operation of the law of equal diffusion to which it is subject, and the source from which the caloric is derived (in the example adduced) is from the sun, which is not intercepted by the atmosphere, provided the thermometric temperature of the air is equal to or greater than that of the water, because the recipient capabilties of air for caloric, are not equal to those of water; hence the caloric transmitted from the sun impinges upon the surface of the water, combines with its ponderable atoms, and generates vapour. Again, in consequence of the law of recession to which such caloric is subject, and of the vapour created being of less specific gravity than the atmosphere, it evolutes from the surface of the water, although the temperature of the bulk of the water may not exceed that of the atmosphere. If such then is the case, the ponderable atoms which originally belonged to the water, and which have left it contrary to the law of gravity, have not been impelled to the evoluting motion, by any inherent active power possessed by such atoms; but their motion is induced by their union with the caloric imparted, and the consequent formation of vapour of less specific gravity than the superincumbent atmosphere.

The *third* example which Mr. Prater supplies (and his favorite one) is the evaporation of water in vacuo.

In the theory which I advocate I have hypothetically stated that all bodies or substances are compounded of ponderable and imponderable atoms; that their form is spherical; that the ponderable atoms are of greater magnitude than the imponderable; that the interstices presented by the union of the ponderable are sufficiently large as to admit of the permeation of the imponderable; that caloric is subject to the law of equal diffusion, and that such law is superior to the law of gravitation. Now, in the example referred to, let us suppose that a vessel containing water is placed under a glass receiver upon the plate of an air pump, that the air is withdrawn therefrom, and that when abstracted an ebullition of the water, and an evaporation of a portion of it occurs. To account for the cause by the theory which I advocate, the glass receiver being composed of spherical ponderable atoms in a state of attraction of cohesion, those atoms present interstices, and as fast as the air is withdrawn from within, the active caloric contained in the air without permeates the receiver, as impelled by the law of equal diffusion, and having filled the space previously occupied by the air, by the same law it rushes in among the atoms of which the air is composed, causes their violent agitation, (producing the action termed ebullition) andseparating a portion of the ponderable atoms upon the upper surface by their intervention, creates a new compound termed vapour, which being specifically lighter than the remaining water in the vessel, is separated from it, and fills the space which the air previously occupied. In support of the rationale of this resulting operation, I would refer to the permeation of caloric through the glass tube of the thermometer by the law of equal diffusion—to the admixture of that caloric with the ponderable and imponderable atoms composing the mercury—and to the consequent expansion or occupation of that space in the tube above, which is said to be void, (but which I believe never is void, being filled with caloric instead of the air which was expelled by the ebullition of the mercury previous to the tube being hermetically sealed.)

If, then, such an opinion is correct, it must be evident that the motion of the water and the creation of the vapour is not the result of *an inherent activity residing in the atoms of which the water is composed*, but of the access of caloric to the interior of the receiver, and its rapid admixture with the water, as induced by the law of equal diffusion to which caloric is subject.

The several examples which Mr. Pra-

ter offers relative to the lapse of time which occurs previous to the admixture of two fluids of unequal density in test tubes, the heaviest being first inserted, make so much against his own theory, I think, that it would be superfluous for me to waste the time of your readers by saying more than that I conceive their slow, gradual and final admixture in opposition to the law of gravity is to be attributed to the affinity subsisting between the several classes of ponderable atoms, which are the components of the two fluids—to the power of attraction exerted between those atoms, the upper surface of the heavier, and the lower surface of the lighter fluid, being superior to the power of gravity exerted on those atoms (their proximity within the sphere of attraction being greater than their relative proximity within the sphere of gravitation) that the ponderable atoms thus united by affinity and attraction, subsequently yield to the power of gravity — sink lower in the heavier fluid, and by their displacement present new surfaces to both fluids — and that the same operation continuing, the final amalgamation of the two fluids is gradually effected.

The next example which I have to notice is the circulation of the blood, which Mr. Prater ascribes to inherent activity possessed by such fluid. If such an opinion is correct, why does it cease to flow, when respiration ceases? The theory of the circulation of the blood throughout the animal system appears to me to have been so satisfactorily attributed to the impartation of caloric to it, resulting from the decomposition of atmospheric air within the lungs—by which decomposition the latent caloric of such air is rendered free and active, and being in amount in excess to the quantity of free caloric possessed by the blood, is to a requisite extent (that of equality) transferred to it by the power of equal diffusion to which caloric is subject—that I cannot see the shadow of a necessity for attributing the circulation to an inherent activity residing in the atoms of which that blood is composed. As the veins and arteries are full of blood, the forcible impartation of atoms of caloric thereto, such veins and arteries being *in plenum*, must necessarily cause the expansion of such blood, and as that expansion cannot take place but in one direction, owing to the "contractile and elastic powers of the heart and arteries," to which Mr. Prater alludes, it must therefore necessarily circulate in one direction from the heart to the extremities, and from the extremities to the heart, and the impartation being incessant, so must the circulation be continuous. If Mr. Prater needs an analogous exemplification of this beautiful system of natural circulation, resulting from the impartation of heat to the blood, I would refer him to the artificial circulation of water by the impartation of heat through Perkins's hot water circulating apparatus.

At the commencement of this paper I had fully intended to take every example which Mr. Prater has brought forward in support of his theory in consecutive order, and to endeavour to refute the opinions which he has sought to inculcate, by observations on each; but finding that I have already trespassed too much on the patience of your readers, the pages of your work, and my own time, I trust that I shall gladly be excused from proceeding further.

And am, Sir,

Your obedient servant,

G. A. Wigney.

Brighton, May, 1840.

FIRE *v.* WATER—ON THE PRESERVATION OF LIVES AND PROPERTY FROM FIRE.

"Oh where can the Turncock be drinking,
Was ever so thirsty an elf?
But he still may tope on, for I'm thinking
The plugs are as dry as himself."—Hood.

Sir,—The recent calamitous fire in Marylebone-street, attended with the loss of two lives, and three others only rescued from the most imminent danger by the skilful and heroic efforts of Inspector Covington and some constables of the metropolitan police, suggest a few remarks upon the circumstances which led to such disastrous consequences.

This fire broke out two doors only from the County Fire-office and engine-station; this office keeps aloof from the London Fire-establishment, maintaining a few firemen, &c. of its own, and it has shown a great disinclination to avail itself of any of those numerous improvements which the experience of the Fire-brigade has proved to be so valuable.

Had the County Fire-engine station been provided—as all the Brigade stations are —with *portable fire-ladders*, it is tolerably certain that no loss of life would have taken place.* Besides which, the rescue of the survivors would have been effected with greater facility and with much less risk, than they encountered in the present instance.

The extremely rapid spread of the fire entirely precluded the timely arrival of any assistance from distant stations, and this evil was mainly attributable to the *absence of water*.

Mr. Carter, foreman of the County Fire-office, ran out his two engines the moment the alarm was raised, but it was upwards of twenty minutes before he could procure a supply of water to set them to work. Several of the Brigade engines having been placed at some little distance from the fire, got water earlier, and their well-directed powers stopped the progress of the flames.

The police appear to have been very remiss in not sending for the turncock. Mr. S. Barber, a neighbour, stated upon the coroner's inquest that "he asked one of the firemen where the turncock lived: he said in Carnaby-street. I went there and to *four or five houses before I could find him*."

Several of the firemen and police proved the delay in obtaining water.

Mr. T. W. Seppingwell, one of the survivors, said that, "hearing Mr. Clark calling out I opened my door, but was almost suffocated by the smoke; I shut the door, and opened the window, and sat on the sill until I was nearly suffocated. I then went in and shut down my window, *and gave myself up for lost!* I, however, rallied myself, and put on my trowsers, waistcoat and coat, and taking my watch from under the pillow, rushed to the window again, when I got out and was assisted by the police along the cornice into the next house. I could see three engines in the street ready to work, but there was no water for twenty minutes. *Had there been water I am of opinion the property and the lives of both the deceased might have been saved.*"

* Since I wrote this communication I have learned with pleasure that this deficiency has been remedied—the County Fire-office having ordered a set of Merryweather's Portable Fire ladders for their engine-station.

* An article on this subject appeared in the *Times*, in which there are some very just remarks, although it is evident the writer's knowledge of these matters is exceedingly limited; he says, on this occasion "no water was to be procured; the turncock was to be sent for, and until he made his appearance the house and its inmates may burn, and the firemen and the crowd of zealous bystanders may look on, unable to render any assistance. In this case two lives were lost by the delay, and those who were so fortunate as to escape, owe their preservation merely to the exertions of their neighbours and the police. The *fire-escapes* which have been so assiduously puffed, were not to be found, and not even a ladder could be procured, when even such aid would have been quite sufficient. Surely this should not happen in such a city as London!"

Again, "if fire-escapes are to be applied to any useful purpose, let one be deposited in every engine house,* that it may accompany the engine and be in the hands of men who understand its use, instead of being either entirely forgotten or rendered useless by the zeal of a well-meaning but unskilful crowd. We have, indeed, but little confidence in any of these recondite inventions, unless they are to be worked by persons practised in their use; but we would suggest that a couple of long ladders in each street, accessible at all times through the policemen on duty, would generally prove efficient. The cost would be only a few pounds, and the inhabitants would, we are sure, willingly subscribe a much greater sum to secure themselves against such risk"

The great extent to which public sympathy has been excited by this catastrophe, has resuscitated some portion of the *ex-Fire-escape Society*, who have calculated upon reaping a good harvest in this district from the recent calamity. I trust, however, the inhabitants will have the good sense *to act for themselves*, and adopt some *more efficient*—even though it be some less showy and less costly—species of protection.

A review of all the circumstances connected with this truly distressing occurrence, strongly suggests the expediency

* Every station-house of the *London Fire-establishment* is so provided.

of the following remedies, as a preventive of similar accidents, viz.—

1. *Some local provision* (such as ladders, &c.) in the hands of the police on duty.

2. *Fire-mains* throughout *all* the public streets, constantly charged with water.

3. Instantaneous communication *by the police* with the *turncocks* and *firemen* in case of fire.

I am, Sir,
Yours respectfully,
Wm. Baddeley.

May 20, 1840.

THE PROPOSED BALLOON TRIP ACROSS THE ATLANTIC.

Sir,—I have seen your account of the model of the proposed apparatus to be applied to Mr. Green's balloon, to enable him to ascend and descend into the right current of air, that is to direct his course while crossing the Atlantic, and think the plan, though perhaps not quite new, ingenious and practicable in short trips. However it should not be entirely relied upon, as it appears to depend on manual labour, and the aeronauts ought to be provided with a more certain and effective power.

While the balloon is crossing the Atlantic, it will most likely meet with vicissitudes and circumstances (though ever so nicely balanced in relation to the weig ht of the atmosphere at starting,) as will produce such an enormous disparity between its power of ascending and descending, and the power to be exerted at the command of the aeronauts, that they ought not by any means to depend on their own exertions to elevate or depress the balloon. I may venture further to assert, that the very same wind, which is to drive along the balloon, will as effectually force them up into any altitude, they wish to attain, or bring them down to any level they choose, if taken advantage of by the most simple means at present known.

Though we have frequently seen designs for aerial ships, with masts, sails and rigging like naval ships, projected on the most erroneous principles, yet we are not on that account, to imagine that it is quite impossible to fix a sail at such an inclination as would powerfully drag the balloon upwards. For instance, no one would deny that a common kite, attached by a cord to the car, or some part of the balloon, or at a convenient distance between the two, as experiment might determine, would fail to overcome the equilibrium of the balloon's atmospheric balance, and continue to draw it higher up into the air, as long as it was allowed to exert it's power.

Then the next thing to be considered is the descending power to be exerted; the reply to which the reader has by this time most likely anticipated, as he will say—'only reverse the sail, or the kite, which is in reality a sail, and by applying it in a similarly oblique position below the car, it cannot but draw down the balloon.'

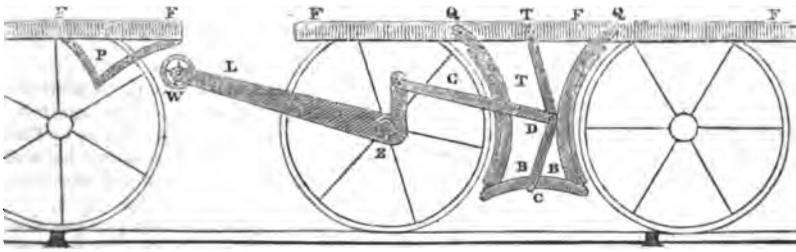
I have only one more observation to make, and that is in reference to the chance an aeronaut has of effecting any perceptible variation in the direction of the balloon, from the direct course that the wind drives it in. How is it possible that he can? Only think of the immense surface of a balloon containing a volume of gas, sufficient to carry only one single aeronaut, and then we need not waste another moment on that head. But it is not possible, if sufficient skill could be attained by the aeronaut, to conduct a sail or sails, large and powerful enough to carry him through the air without the aid of a balloon, that he would then have it in his power to alter his course, very considerably from that of the wind. It is pretty certain that he would, for any one who has been accustomed to observe the flight of birds, particularly rooks, must have seen that they are, in what is called high winds, driven along in various directions, very rapidly, over a space of many hundred yards, without making more than a very slight occasional alteration, in the position of their wings, that is, they do not at all attempt to fly, but having their wings spread out, they are carried along without any exertion, and that in various directions.

Should these few hints induce others, who are not so immoveably attached to the modern system of aerostation to give their attention to the subject, it is not improbable, but we may, ere long, see the art become a familiar, very popular, and every day recreation.

I am, Sir,
Your obedient servant,
Spectator.

London, April 14, 1840.

SELF-ACTING SAFETY BRAKE, FOR BRINGING UP RAILWAY CARRIAGES WITH EASE AND EXPEDITION.



Sir,—I need not inform the scientific portion of your readers, that a surer and more expeditious method of bringing up railway trains, whilst travelling at high velocities, in cases of sudden emergency, has been a deficiency long felt by those connected with locomotive machinery, and which the following plan will, I think, adequately supply.

Here it will be at once seen, that the old enemy who hitherto has stared us full in the face, is converted into a friend of no ordinary worth, if there be any truth in the old saw, "A friend in need, is a friend indeed."

Supposing a railway train to be travelling at a great velocity, the steam suddenly cut off, and a powerful manumotive brake applied to both engine and tender alone, the sudden check will cause the whole train to rush together with considerable violence. Now this property of the carriages rushing upon one another, is converted into the stopping power or agent, the carriage following, acting upon the brake of the carriage in advance.

The prefixed figure is the carriage in advance, having the new brake attached: the near wheels are removed for bringing the parts into view.

B, B, are the brakes faced with wood, turning upon their centres Q, Q; C, a curved spring for releasing the brakes, and strong enough to resist the required pressure; T, a knee joint turning freely upon the centres T D E, to which is attached a bar G, to which latter bar is attached the lever L, having its fulcrum at Z. Power is to be applied at W, which is depressed by the inclined plane P of the following carriage running upon it; W, a roller the breadth of the carriage.

It will be seen from the above plan, that each carriage can be fitted with eight brakes, so that in a train of twelve carriages, (the brakes on the last carriage being idle,) we should have no fewer than *eighty-eight* brakes ready for action in an instant, and under the immediate control of the engineman and assistants, with the amount of stopping power always coinciding with the momentum of the moving train.

Yours, &c.

Wm. Jones.

Manchester, May 25, 1840.

EXPERIMENTS ON NUT GALLS.

Sir,—Having never met with any satisfactory explanation, as to the chemical changes, which ensue on the mixture of an infusion of nut-galls and sulphate of iron, I was induced to make the following series of experiments on the subject, which have I hope thrown some light on it.

Mix with a concentrated infusion of nut-galls, persulphate of iron, and a black precipitate will be the result; if now oxalic acid be added, the colour is speedily destroyed; a nearly white substance remains at the bottom and the liquid will no longer blacken sulphate of iron, but will form a precipitate with gelatin.

Concentrated sulphuric, and muriatic acids form with infusion of galls a white precipitate; the oxalic acid affords none but these, and all the acids which I tried, deprive the infusion of its power to decompose sulphat of iron, although it precipitates gelatin.

When the tannin is removed from an

infusion of galls by gelatin, the liquid does not seem capable of forming a solid with concentrated sulphuric acid.

If gallate of iron, formed by the addition of the peroxide to an infusion of galls, be decomposed by oxalic acid, a very small quantity of precipitate is obtained, which does not at all appear like that afforded by the decomposition of the gallate of iron, formed from the sulphat.

The white substance procured by adding concentrated sulphuric acid to a strong infusion of galls, has the following properties; when first formed it is white, but if it be washed with water, and stirred, it soon appears to suffer decomposition, and becomes a brown glutinous paste, which is soluble in water, has a very astringent taste and forms precipitates, with gelatin and solutions of oxide of iron.

That white substance which is yeilded by the decomposition of gallate of iron, procured from the sulphate, is much more permanent, and appears to consist of two compounds, one similar to the last described, and another which is a yellow powder; when repeatedly washed with water until it no longer reddens litmus, and ammonia is poured on it, it soon becomes of a brownish red colour, contains an abundance of oxide of iron, and sulphat of ammonia, but gives no traces of either gallic acid or tannin, although there can be little or no doubt, that either one or the other, or perhaps both, were contained in it before the ammonia was added.

Now from what has been said, there is every reason to believe that acids combine with gallic acid and tannin, so that the property possessed by an infusion of galls, to take metallic oxides, from the most powerful acids is explained by considering it a species of double decomposition—the acid contained in the salt unites to one portion of the infusion of galls, and the oxide combines with another portion.

A TANNER'S APPRENTICE.

ON LETTER-COPYING.—PLOWMAN'S IMPROVED COPYIST.

Sir,—It is frequently desirable, and sometimes necessary, both in commercial and domestic intercourse, to retain copies of the written correspondence, and it is now about half a century since the celebrated Watt invented and patented his copying-press, for the attainment of this object in a very perfect manner by an elegant and ingenious process.

Since the expiration of Watt's patent, other manufacturers have given their attention to these matters; some have continued to use the screw-press as at first employed, while others have introduced various improvements of different degrees of merit.

Modern ingenuity, however, has discovered that the copying process may be very effectually performed without the aid of these formidable auxiliaries—formidable, whether we consider their original cost, the room they occupy, or the labour employed in using them.

Some time since, Mr. Plowman, of Oxford, introduced an "improved copyist," which greatly surpasses every other contrivance for this purpose, in the important points of portability, facility of operation, neatness and economy. Having used this article, I have much pleasure in calling general attention to its merits, as it only requires to be better known to be still more extensively employed. It consists of a portfolio, large quarto post size, containing about fifty leaves of a thin yellow unsized paper. In order to insure a perfect copy of any letter, you must write upon *good paper* with *copying-ink;* that supplied by Mr. Plowman (a small bottle with each copyist) is well adapted for the purpose. The subsequent operations are as follow:—Place a folded sheet of blotting-paper on the left-hand of the copying-portfolio, and upon it one leaf of the thin yellow paper, which is to be moistened with clean water by means of a sponge or flat camel-hair brush, removing any superfluous water with the blotting-paper; next place the letter to be copied on the right-hand side of the book, and turn back upon it the damped leaf and blotting-paper; pass the palm of the hand carefully all over the letter, using pressure, and the yellow leaf will retain a perfect fac-simile of the written document. With letters of more than one page, the same process must be observed with each. In order to read the copy thus transferred, place a sheet of white paper under it, when it will become perfectly legible.

It has been supposed that the opera-

tion of the New Postage Act, will considerably increase the number of letters, and it is apprehended by some that the delivery will be less certain, and that the necessity of copying letters will be greater than ever. Every contrivance, therefore, tending to facilitate this object becomes at this time of considerable importance. To men of business, and in fact to all who write letters, Plowman's copyist seems to be almost indispensable.

I remain, Sir,

Yours respectfully,

W. BADDELEY.

London, May 15th, 1840.

THE CALCULATOR. BY J. W. WOOLLGAR, ESQ., No. 8.—CONTENTS OF EXCAVATIONS.

In No. 6 of this title, (vol. xxxii. 102) I gave as a third example of special gauge lines applied to the slide-rule, the problem of finding the content of a pyramidal frustrum. Not knowing whether practical men would consider it worthy of their notice, I deemed it unnecessary to give much explanation. But I have lately been requested to state the method more fully, which I do the more willingly, from finding that an error of transposition has crept into the formula originally given.

To avoid a long introduction, I refer, as before, to Mr. Bidder's Table (reviewed in M. M.; xxiii. 200). The object of that table and of my formula is not to assist in the computation of cuttings which are throughout of uniform depth and width, but of those portions which diminish uniformly from end to end. These are to be considered as in three parts. The middle portion will be a trapezoidal section, of the same width as that of the bottom, and therefore reducible to a rectangular solid, by taking the arithmetical mean of the depths. The content of this portion is obtained by these formulæ.

A	sum of extreme depths, feet.	Middle area, square feet.
B	2	bottom width feet.
A	content, cubic yards (1).	Middle area
B	length, chains.	0·4091.

With a double slide rule, or with one having half the line A inverted, commencing at 0·8182, one operation would suffice.

The two outer portions (assuming the slopes to be "1 to 1") constitute together a square pyramidal frustum, to work which the line V is brought into action.

A	depth at lesser end, feet.		
B	depth at greater end, feet.	V	special gauge feet.
C	content, cubic yards (2)		Length in chains mult. by ratio of slopes.*
D	depth at greater end.		gauge point found.

Adding together the results (1) and (2) we have the whole solidity.

The following numerical illustration corresponds with one of Mr. Bidder's examples. Required the content in cubic yards, of a cutting 9 chains long, 23 feet wide at bottom, depths at ends 35 and 20 feet respectively, with slopes $1\frac{1}{2}$ to 1?

A	35+20		$632\frac{1}{2}$
B	2		23
A	13910		$632\frac{1}{2}$
B	9		·4091
A	20		
B	·35	V	·804
C	25570		$9\times1\frac{1}{2}$
D	35		·804

Whence, 13910+25570=39480, the solidity.

Mr. Rooker has been furnished with the computed numbers for the line V, from which he has executed a pattern to 15 inches radius, and has, I believe prepared some rules expressly for these calculations.

Mr. Laker's Treatise.

Some observations from Mr. Laker were of course to be expected, but (with submission to the Editor) it appears to me that a reply at large to this young man's most unscrupulous assertions, would be inconsistent with self respect

* Since the ratio of the slopes is generally simple, *i.e.* $1\frac{1}{2}$ to 1; 2 to 1, &c., it is easier to multiply the length by that ratio, than to perform the multiplication upon the content reduced from the simple length.

and a regard to the claims of your numerous correspondents. On reperusal of my statement, I see no reason to retract or vary a single expression, and if any person should feel particularly interested in the dispute, I would request him to compare Mr. Laker's book (I should say *tract*) and mine, not doubting that the conclusion which he must draw from the intrinsic evidence of the two, will guide his judgment correctly as to matters of mere personal assertion on each side. It affords me much gratification to find from the kind remark of the Editor, that the character of Mr. L.'s communication is almost self-evident.

I am, &c.

J. W. WOOLLGAR.

Lewes, May 28, 1840.

ESTIMATES OF ENGINE POWER.

Sir,—Since "Indicus" and "Nautilus" have brought their excellent dissertation to a close—permit me now to ask them through your pages, whether the method of ascertaining the power applied to the hydraulic-belt, by weighing the end of the crank-shaft, and then estimating that half this weight pressed on the teeth of the wheels, is correct? And whether the whole of this weight does not support itself on these teeth? And further, whether if the weight necessary to keep down the shaft during the working of the machine is to be halved, ought not both ends of the said shaft to have been weighed? As these are purely mechanical questions and of very considerable importance, seeing that if my views are correct, the useful effect of the machine must be reduced one half—perhaps you will excuse the trouble I am giving you. If a diagram of the manner of testing the power in this way is required, I shall be happy to furnish one, but I have no doubt that the particulars are well known to most of your readers.

I am, Sir,

Yours respectfully,

A, B or C.

1 June, 1840.

MANUFACTURES OF HORN AND TORTOISESHELL. BY ARTHUR AIKIN, ESQ., LATE SECRETARY OF THE SOCIETY OF ARTS.

[Abridged from *Transactions of the Society* for 1839, Part II.]

Horn.

Almost the only kinds of horn that are the subject of manufacture are those of the bull and cow, and the hoofs of these animals; the horns of the bullock being thin, and of a very coarse texture, are used only for the most ordinary purposes. Our domestic supply is by no means equal to the demand, so that great quantities are imported from Russia, the Cape of Good Hope, and South America.

The first process is the separation of the true horn from the bony core on which it is formed: for this purpose the entire horns are macerated in water for a month or six weeks, according to the temperature; during this time the membrane which lies between the core and the horn is destroyed by putrefaction, so that the core becomes loose, and can easily be extracted. The cores are not thrown away, but are burnt to ashes, and in this state form the best material for those small tests or cupels employed by the assayers of gold and silver.

The next process is to cut off with a saw the tip of the horn, that is, the whole of its solid part, which is used by the cutlers for knife-handles, is turned into buttons, and is applied to sundry other purposes. The remainder of the horn is left entire or is sawn across into lengths, according to the use to which it is destined. Next, it is immersed in boiling water for half an hour, by which it is softened; and, while hot, is held in the flame of a coal or wood fire, taking care to bring the inside as well as the outside of the horn, if from an old animal, in contact with the blaze. It is kept here till it acquires the temperature of melting lead or thereabouts, and, in consequence, becomes very soft. In this state it is slit lengthways by a strong-pointed knife, like a pruning-knife, and by means of two pairs of pincers applied one to each edge of the slit, the cylinder is opened nearly flat. These flats are now placed on their edges between alternate plates of iron, half an inch thick and eight inches square, previously heated and greased, in a strong horizontal iron trough, and are powerfully compressed by means of wedges driven in at the ends.

The degree of compression is regulated by the use to which the horn is to be afterwards applied; when it is intended for leaves of lanterns, the pressure is to be sufficiently strong (in the language of the workmen) to break the grain; by which is meant separating, in a slight degree, the laminæ of which it is composed, so as to allow a round-pointed knife to be introduced between them in order to effect a complete separation.

The plates thus obtained are laid one by one on a board covered with bull's hide, are fastened down by a wedge, and are then scraped with a draw-knife having a wire edge turned by means of a steel rubber;

when reduced to a proper thickness and smoothed, they are polished by a woollen rag dipped in charcoal dust, adding a little water from time to time, then are rubbed with rotten stone, and finished with horn shavings. The longest and thinnest of the films cut off by the draw-knife, when dyed and cut into various figures, are sold under the name of sensitive Chinese leaves (being originally brought from China), which, after exposure to a damp air, will curl up as if they were alive when laid on a warm hand or before the fire.

For combs, the plates of horn should be pressed as little as possible, otherwise the teeth of the comb will split at the points. They are shaped chiefly by means of rasps and scrapers of various forms, after having been roughed out by a hatchet or saw: the teeth are cut by a double saw fixed in a back, the two blades being set to different depths, so that the first cuts the tooth only half way down, and is followed by the other which cuts to the full depth; the teeth are then finished and pointed by triangular rasps. If a comb or other article is too large to be made out of one plate of horn, two or more may be joined together by the dexterous application of a degree of heat sufficient to melt but not to decompose the horn, assisted by a due degree of pressure; and when well managed, the place of juncture cannot be perceived. The Chinese are remarkably skilful in this kind of work, as may be seen in the large globular lantern in the Museum at the East India House, about four feet diameter, composed entirely of small plates of coloured and painted horn. Horn combs are made in London, in York, and in many other English towns, but the chief manufactory of them is at Kenilworth, in Warwickshire.

If a work in horn, such as one of the large combs worn by women, is required to be of a curved or wavy figure, it is finished flat, and is then put into boiling water till it becomes soft, and is immediately transferred to a die of hard wood, in which it is cautiously pressed, and remains there till cold.*

Horn combs ornamented with open work are not made in this country, because the expense of cutting them would be more than the price of the article would repay; but great numbers of them are imported from France. These, however, are not cut, but pressed in steel dies made in London for the French manufacturers; and from an examination of these combs, it is evident that the material must have been in a soft state, approaching to fusion, when put into the die. On referring to French authorities, I find it stated that horn steeped for a week in a liquor, the active ingredient of which is caustic fixed alkali, becomes so soft that it may easily be moulded into any required shape. Horn shavings subjected to the same process become semi-gelatinous, and may be pressed in a mould into the form of snuff boxes and other articles. Horn, however, so treated becomes hard and very brittle, probably in consequence of its laminated texture being obliterated by the joint action of the alkali and strong pressure.

Drinking cups of horn are thus made. The horn being sawn to the required length is scalded and roasted over the fire, as already described; but instead of being slit and opened, is placed while hot in a conical mould of wood; a corresponding plug of wood is then driven hard in to bring the horn to shape. Here it remains till cold, and is then taken out and fixed by the large end on the mandril of a lathe, where it is turned and polished both inside and outside, and a groove, or chime as the coopers call it, is cut by a gage-tool within the small end for receiving the bottom. The horn is then taken off the lathe and laid before the fire, where it expands and becomes somewhat flexible; a round flat piece of horn, of the proper size (cut out of a plate by means of a kind of crown-saw), is dropped in, and forced down till it reaches the chime, and becomes perfectly fixed in this situation and water-tight by the subsequent contraction of the horn as it cools. Capt. Bagnold informs me that he has seen in South America a nest of such cups turned to a thickness not exceeding that of a card, and accurately fitting into each other, the outer one holding about a pint, and the inner one little more than an ounce.

Horn is easily dyed by boiling it in infusions of various colouring ingredients, as we see in the horn lanterns made in China. In Europe it is chiefly coloured of a rich red brown to imitate tortoiseshell, for combs and inlaid work. The usual mode of effecting this is to mix together pearlash, quicklime, and litharge, with a sufficient quantity of water and a little pounded dragon's blood, and boil them together for half an hour. The compound is then to be applied hot on the parts that are required to be coloured, and is to remain on the surface till the colour has struck; on those parts where a deeper tinge is required, the composition is to be applied a second time. For a blacker brown omit the dragon's blood. This process is nearly the same as that employed for

* Combs among the Romans were made of box-wood.

Quid faciet nullos hic inventura Capillos
Multifido *Buxus* quæ tibi dente datur.—MART. Epig. xiv. 25.

giving a brown or black colour to white hair, and depends on the combination of the sulphur, which is an essential ingredient in albumen, with the lead dissolved in the alkali, and thus introduced into the substance of the horn.

In very early times bows were made of horn. Homer describes the bow of Pandarus (*Il.* iv.) as made of the two horns of a wild goat united base to base, reduced into proper form and polished, and then tipped with gold. The bow of Ulysses was also of the same material. (*Odyss.* xxi.) The long bow of the English archers was, I believe, entirely of wood; but in the East, even at the present day, bows are made entirely, or in part, of horn. To the kindness of Colonel Taylor I am indebted for the opportunity of exhibiting to you a Chinese bow, made partly of wood and partly of buffalo's horn. The same gentleman likewise informs me that he has bought in Calcutta pretty good bows made entirely of buffalo's horn; but the best Indian bows, those namely of Lahore, are made of horn combined with wood, and strapped round with sinew. Horn lanterns were also used by the ancients, for we find one mentioned in the *Amphitryo* of Plautus, and in an epigram of Martial. Pliny also speaks of horn lanterns, and says that various other ornamental articles were made of dyed and painted horn.

Horn was also used as we now employ glass in windows, for which, however, it is not very well adapted, as plates thin enough to be transparent would soon warp, and be corroded by exposure to the weather.

Horns are also of very ancient use as musical instruments: the true bugle-horn was made of the horn of the urus, or wild bull, tipped with silver, and slung in a chain of the same material.

Another use to which horn has been applied is as a material for defence. I remember to have seen, several years ago, a complete suit of scale armour made of horn. It was said to have come from Arabia, and seemed very capable of turning the edge of a sword or a pistol bullet.

Tortoiseshell.

The general mode of manufacturing tortoiseshell is the same as I have already described when treating of horn. It is softened by boiling in water, but mere water takes away much of the colour: an addition of common salt prevents this injury; but if too strong a brine is used the shell will be very brittle. Two or more pieces of tortoiseshell may be joined by laying their scraped or thinned edges together, and then pressing them between hot iron. If, however, the heat is too great, the colours are much deepened so as to become almost black, as is the case with moulded snuff boxes; for tortoiseshell being less fusible than horn, cannot be made soft enough to be moulded without some injury to the colour. Accordingly the manufacturers, at least in England, never attempt to produce tortoiseshell combs with ornamental open work by means of dies, but in the following manner.

A paper being pasted over the tortoiseshell, the pattern is drawn on the paper, and is then cut out by means of drills and fine saws: the paper is then removed by steeping in water, and the surface of the pattern is finished by the graver.

In making small side combs it is found worth while, in order to save a costly material, to employ a machine consisting of a cutter working straight up and down, and of a bed (on which the shell is laid), to which is given a motion advancing by alternate inclination, first to one side and then to the other. By this means the teeth of two combs are cut at the same time, those of the one occupying the intervals of the other. Such combs are called *parted*, the saw not being used upon them, and are often made of fine stained horn instead of tortoiseshell. Tortoiseshell is also used for inlaying tables, cabinets, and other ornamental articles, a metallic foil being placed below it to give lustre and colour. This employment of it appears to be coming at present considerably into fashion.

Among the Romans of the Augustan age, this taste was not so much a fashion as a fury. The frames of the couches on which they reclined at table were covered with the largest and most beautiful plates that could be procured of tortoiseshell, and it was employed for various other similar purposes; but I am not aware that it was ever used by them as a material for combs. It was brought by Indian and Arabian traders from the islands in the Indian Sea to Adulis, in Abyssinia, together with ivory, rhinoceroses' horns, and hippopotamuses' hides. Here it was purchased by Egyptian merchants, was transmitted to Alexandria, and thence passed to Rome and the other great cities of the empire. For modern uses, thick tortoiseshell is more valuable in proportion than thin, but among the Romans, where it was used only for inlaying, veneers were cut out of it. This art was the invention of one Corvilius Pollio, a man, as Pliny says, of singular sagacity in all things that ministered to prodigal luxury.

RETURN to an Order of the Honourable The House of Commons, dated 24th March, 1840;—*for*,

AN ACCOUNT, showing the several COUNTRIES to which MACHINERY has been exported, with Official Value thereof, in each Year, from the 1st day of January, 1830, to the 1st day of January, 1840 inclusive; including Steam Engines and Parts of Steam Engines, Mill Work of all Sorts allowed by Law to be exported Machinery of all other Kinds allowed by Law to be exported, and Machinery exported under License from the Treasury or Privy Council.

COUNTRIES TO WHICH EXPORTED.	YEARS ENDING 5TH JANUARY.									
	1831.	1832.	1833.	1834.	1835.	1836.	1837.	1838.	1839.	1840.
	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.
EUROPE:										
Russia	1,428	2,141	1,451	8,201	8,512	2,198	8,838	16,464	18,714	30,911
Sweden	22	1,203	40	103	794	3,753	1,951	286	2,868	1,563
Norway	..	168	203	200	5	150	141	273	929	31
Denmark	5,020	115	2,670	2,967	2,698	9,831	149	2,478	3,266	1,876
Prussia	390	226	96	2,159	605	962	1,990	6,576	19,046	11,126
Germany	4,712	5,308	6,816	10,287	14,520	26,132	15,644	35,354	59,669	70,235
Holland }	7,037	6,018	5,358	{ 7,718	12,787	14,191	18,269	42,857	48,847	48,278
Belgium }				{ 1,632	7,619	8,475	11,848	38,548	64,946	40,722
France	36,651	10,306	17,829	18,476	36,802	46,471	75,328	61,768	124,361	182,829
Portugal, Azores and Madeira	154	38	93	261	1,253	5,437	1,233	753	633	1,331
Spain and the Canaries	6,525	2,236	5,600	7,204	2,783	6,197	5,612	5,329	4,956	4,958
Gibraltar	102	341	12	56	269	1,589	541	671	250	3,225
Italy	12,248	1,277	4,430	4,343	15,989	28,362	22,489	69,533	41,985	29,097
Malta	130	..	..	..	41	209	783	87	188	35
Ionian Islands	80	45	750	6	137	478	2,744	568	67	25
Morea and Greek Islands	..	..	..	..	10	837	8	..	..	49
Turkey and the Levant	161	2,352	2,995	9,818	1,370	403	4,223	16,741	18,897	10,686
Syria and Palestine	..	..	..	..	..	..	15	..	..	2,305
Isles Guernsey, Jersey, Alderney and Man	503	731	356	2,585	365	1,561	1,287	2,224	1,078	968
ASIA										
The East Indies and China	10,938	8,927	13,462	20,192	38,747	15,215	14,724	12,388	52,076	83,721
Australian Settlements	1,630	4,223	1,101	5,072	8,637	7,210	5,249	8,923	5,101	14,862
AFRICA:										
Egypt	1,075	5,510	146	995	625	2,221	4,502	11,408	8,132	18,856
Mauritius	8,172	4,505	1,420	1,687	1,860	6,301	6,581	22,066	23,560	13,788
Other Parts of Africa	9,891	895	1,416	796	551	2,712	1,057	4,652	1,882	4,375
AMERICA:										
British Northern Colonies	3,839	4,290	1,002	1,838	1,716	4,181	3,751	11,467	4,936	9,868
British West Indies	50,744	15,033	9,661	10,214	18,738	31,785	40,177	57,892	42,858	35,353
Foreign West Indies	18,449	8,411	1,014	1,524	1,767	9,098	12,865	33,019	21,812	18,777
United States	10,913	8,637	6,883	8,828	28,699	45,706	24,061	13,862	30,303	7,184
Brazil	14,255	12,055	4,884	2,671	6,822	15,208	6,911	11,484	13,857	15,701
Mexico	2,996	593	206	1,616	1,018	3,832	3,825	2,980	8,533	2,409
Guatemala	..	..	..	..	..	..	..	..	..	3
Columbia	534	80	197	50	167	1,101	327	198	2,148	2,926
Peru	15	153	820	330	440	806	1,995	1,440	2,150	2,764
Chili	120	8	2,266	322	664	1,215	69	859	223	3,552
States of the Rio de la Plata	38	222	..	18	72	4,022	40	390	10	9,901
Total .. .. £	208,767	105,491	93,715	127,064	211,982	307,951	302,093	493,468	627,430	683,265

Inspector-General's Office, Custom House, London,
18 April, 1840.

WILLIAM IRVING,
Inspector-General of Imports and Exports.

NOTES AND NOTICES.

Raising Empty Casks.—Mr. Bowles, the author of the clever postage-cover advertising plan, noticed in our last, has invented a very simple and efficient apparatus for raising empty casks. It consists of a link attached to the end of the lifting rope, and terminating below in a swivel; on the swivel, and moving easily upon it, is a short cross-bar, so adjusted as to hang level. The use of the apparatus is obvious. The bar is to be held in a line with the link while introducing it through the bung-hole into the cask; being then let go, it hangs across, and being too long to pass through the bung hole when in this position, it allows the cask to be lifted or lowered securely, and is afterwards disengaged simply by bringing the cross-bar into a vertical position before raising it out of the cask.

Products of the Irish Loom.—We have been favoured with the inspection of some of the most beautiful products of the Irish loom which probably ever proceeded from it. They are from the Ardogne damask manufactory; and, in particular, some table-cloths of large dimensions, made to the order of Adrian Hope, Esq., Carlton-gardens, are, both in fabric and design, the most sumptuous, yet elegant things of the kind we have ever seen. In the centre is the crest, with the motto, *At spes infracta*, surrounded with a wreath of laurel; whilst round the border runs a broad, rich scroll, elaborate yet tasteful as the choicest Arabesque. The texture of these cloths is fine as satin, and yet their substance argues an almost never-ending durability. They are a proud triumph of the loom, and far surpass any fabrics for the same purpose that have fallen under our notice, either of foreign or domestic manufacture.—*Atlas.*

Hard and Soft.—It was stated at a recent meeting of the Institute of British Architects, that the stone with which Henry VII.'s Chapel has been repaired, and on which 40,000*l.* has been expended, is already in a state of decay, and will in ten years be a ruin, owing to the softest quality of the Bath stone having been used for the purpose; and that the Banquetting House at Whitehall, having been repaired with Reigate stone, may expect the same fate. This at any rate is hard enough for those who have to pay for it, while it shows that we have soft people as well as soft stones among us.—*Argus.*

M. Leopold de Buch, of Berlin, has been elected by the Paris Academy one of its eight Foreign Associates, in the room of the lamented Blumenbach,—against a numerous list of nominees, which included the names of Brewster, Faraday, and Herschel; and a commission of its members has been appointed for the purpose of proposing a list of candidates, to fill the similar vacancy created by the recent death of M. Olbers.

The Archimedes steamer, on board which Captain Chappel, R.N., is embarked, to report upon her qualities to the Admiralty, arrived here on Thursday from Southampton, having made the passage to the harbour's mouth with sails alone, going nine knots per hour. That day at noon, having taken on board Sir Edward Codrington, Naval Commander-in-Chief, Admiral Bouverie, second in command, Lord Dundonald, Sir Thomas Hastings, captain of the *Excellent*, Colonel Pasley, Royal Engineers, Captain Mitchell, R.N., of the *Magicienne*, Captain Basil Hall, R.N., and about twenty other naval officers, together with several scientific gentlemen from the Royal dockyard, she started with a fair wind for St. Helen's, under sail, without any fires lighted. She afterwards luffed up, and made several tacks through Spithead, and finally, taking in all sails, lighted the fires, connected the screw, and steamed into harbour, beating both the Isle of Wight steamers, though they had steam and sails, and the *Archimedes* had steam only. As a *finale* she kept threading in and out among the line-of-battle ships, backing and turning in every direction. Sir E. Codrington, and the other leading persons, expressed their entire satisfaction at the result of this experimental trip. In order to make known her qualities as much as possible the *Archimedes* is to proceed to Plymouth, Bristol, Liverpool, Glasgow, and Dublin.—*Hampshire Telegraph, May* 28.

Wreck of the Royal George.—Professor Daniell's and Mr. Smee's Galvanic Batteries.—Col. Pasley has resumed his operations upon the *Royal George*. All is clear now above the orlop deck, except some beams of the lower deck, which still remain. On Saturday, the 23d of May, red flags were hoisted on board the two lumps, at 10 o'clock, as a signal that two explosions of 250 lbs. of powder each would take place at the next slack tide, and two divers were sent down to make preparations for placing the two charges, one under the main hatch of the orlop deck, the other near the bread-room. Lieutenant Symonds, the executive engineer who made all the arrangements on this occasion, then sent down the charges with the divers, and having removed the lumps to a little distance, he posted himself at one voltaic battery, whilst Serjeant-Major Jones had charge of the other. Colonel Pasley then gave the word "fire," but only one explosion took place, which was effected by four cells of Professor Daniell's battery at the distance of 240 feet. This produced the usual effect of a great commotion in the water, in the form of an inverted bowl, spreading to a considerable distance, but not rising to any great height, several seconds elapsing, after a sharp shock was felt, before this agitation of the water took place. The second explosion, which was to have been fired by means of Mr. Alfred Smee's new voltaic battery, did not take place on completing the circuit. Sergeant-Major Jones, being ordered to complete the circuit a second time, he did so, and on keeping up the contact for about four seconds, the explosion was effected at the distance of 400 feet.—*Hampshire Telegraph.*

Rise of the Demidoffs.—The founder of this rich and powerful family was an experienced blacksmith of the name of "Demid Antuffy," whose son Nikita commended himself to the patronage of Peter the Great, as a skilful member of the craft. For the first 300 halberds which he made according to a German model, Peter paid him three times as much as he asked; nay, he condescended to pay him a visit under his own roof; and a goblet of wine being presented to the monarch on this occasion, he is said to have observed with some degree of asperity, "What, smith, thou hast foreign liquors among thy stores! Let me have some brandy: that is not an expensive drink and agrees well with a Russian stomach!!" The immediate consequence, however, of this visit, was a grant of land for a manufactory of arms, with which iron works were to be united, in the neighbourhood of Tula. This was the groundwork of the subsequent affluence of the family. Antuffjeff had already turned his avocation to so rich an account, that, upon the birth of the Grand Duke Peter Petrovitsh, he went to St. Petersburgh, and presented the court with a variety of articles of gold which he had extracted from the Siberian mines; and when the young Grand Duke cut his first tooth, he made him a present of 100,000 rubles. The imperial rescript which gave him rank as a nobleman, bears date on the 12th September, 1720, from which time Demidoff became the family name.—*United Service Journal for June.*

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 879.] SATURDAY, JUNE 13, 1840. [Price 3d.

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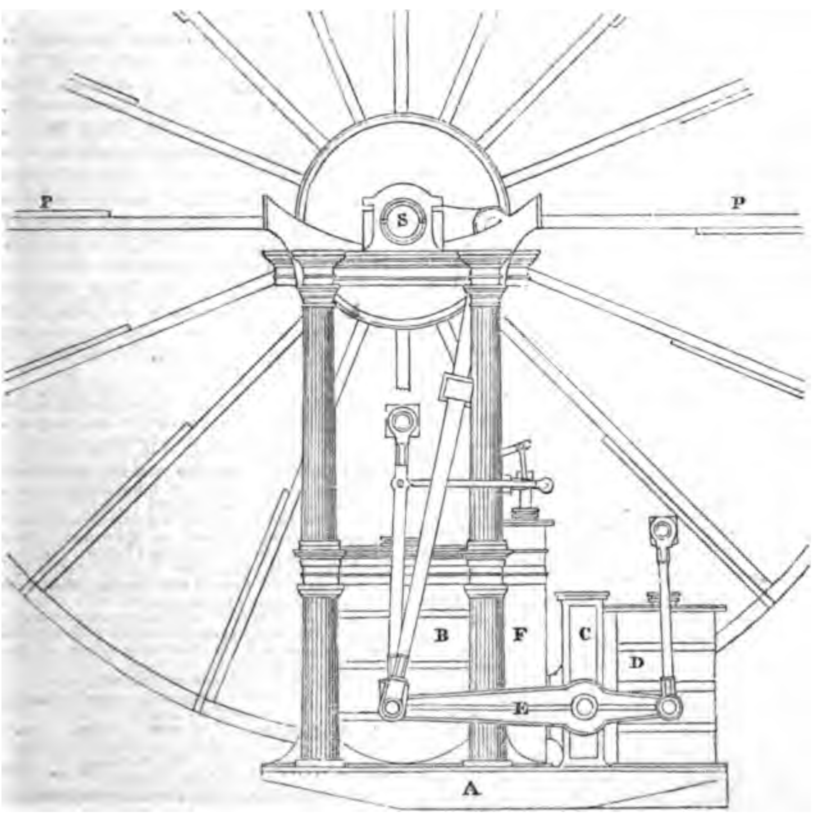
MR. RENNIE'S IMPROVEMENTS IN STEAM VESSEL MACHINERY.

Fig. 1.



IMPROVEMENTS IN STEAM VESSEL MACHINERY, BY GEORGE RENNIE, ESQ. C.E.—MORE EQUABLE ADJUSTMENT OF THE MACHINERY—TRAPEZIUM PADDLE-WHEEL — CONOIDAL PROPELLER.

1. *Adjustment of Machinery.*

At the *soirée* of the President of the Civil Engineers' Institution, on the 27th ult., a very beautiful model was exhibited of a marine steam engine on a plan of construction and arrangement proposed by George Rennie, Esq., which presents several points of novelty well deserving the attentive consideration of marine steam engine builders.

The engraving, fig 1, exhibits an inner side view of this model, and fig. 2 a transverse view. The engine represented is meant to be of 280-horse power, and the reader is to suppose that there is, as usual, a companion to it of the same power, though for clearness sake it is omitted in the engraving. Instead of *two* engines however in such a case, Mr. Rennie would prefer that there should be *four* employed, of 140-horse power each, and this on account of the greater facility which such a division would give to his system of equal distribution of weight to be presently explained.

A is the platform (of about one-half the usual weight); B, the cylinder, 84 inches diameter; C, the condenser; D, the air pump; E, side lever; F, side valves; P, paddle-wheel; S, main shaft.

The cylinder, the air pump, the condenser, and the slide valve cases, all rest on the platform as usual, but instead of the motion being taken as at present from the opposite ends of the side levers, the motion is communicated from the piston rod to the crank, through the medium of the side rod, and the same end of the lever, while the weights of these rods are counterbalanced by the air pump. The pillow blocks and entablature rest immediately upon two ranges of columns, which rest again on the platform at the base, and embrace the cylinders by entablature and architrave frames. The upper parts of the pillow block entablatures are made fast by dovetails let into cast iron plates bolted to the transome beams which run across the vessel; by which means any settlement, or sinking in the frame work of the engine is effectually counteracted. An arrangement similar to this has been followed in several of those splendid steam vessels which have recently been sent across the Atlantic and to other distant places; but Mr. Rennie proposes, with a view of distributing more equally the immense weight of the engines throughout the vessel, and of counteracting the shocks of the waves, to adopt a more extensive system of bracing, both by oblique and suspending riders than has hitherto been done. The principle on which he proceeds is the obviously sound one of opposing to each and every portion of dead weight, some counteracting weight or force of equal amount, so that by distributing the engine power and weight over every part of the vessel affected by the engine, all injurious strain on any particular part may be avoided. He would on the one hand make the vessel proof against every external force which might tend to crush her inwardly, and equally proof on the other against every internal force which might tend to thrust her asunder. Mr. Rennie thinks that this equilibrum, or mutual balance of forces both outwardly and inwardly is not sufficiently attended to at present. Indeed, when we consider that the weight of some of the large engines including the boilers, is not less than from 400 to 600 tons; that this weight often occupies one-fourth or one-third of the midship space of a vessel; that the tendency to bring up or weigh down the stem and stern, or break the body, is always varying on account of the greater or less weight of the cargo, and the uncertain action of the waves—it does seem a wonder that these immense steam vessels should perform so well as they do. True they do their duty, but it is at an expenditure in wear and tear, which cannot be otherwise than enormous.

Mr. Rennie calculates that the saving to be effected by his new plan of arrangement will be as follows:—

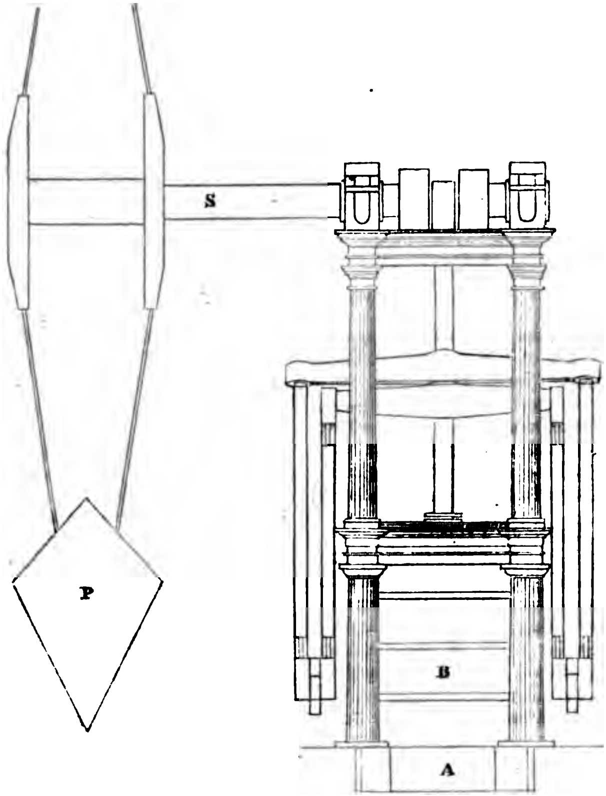
	Old plan.	New.	Saving.
	tons.		
Weight of engines	212 ..	122 ..	90
	sq. ft.		
Area....................	868 ..	568 ..	300

In the boilers Mr. Rennie proposes no alteration.

2. *Trepezium Paddle-wheels.*

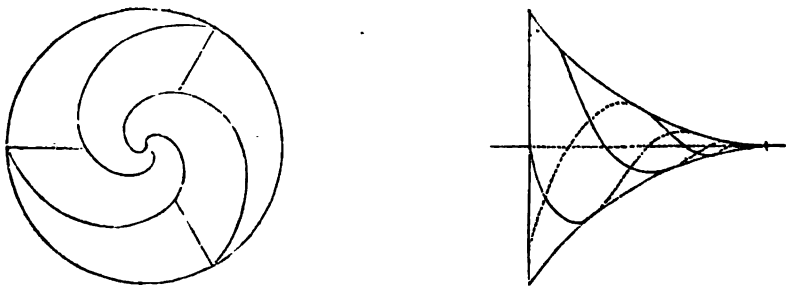
The paddle-wheel in the model we have been describing, is, it will be seen, on the trapezoidal plan, for which

Fig. 2.



Mr. Rennie has recently obtained a patent, some very successful experiments, with which we have before noticed in our pages. (See vol. xxxii., p.p. 172, 274, 351, 536.) The experiments alluded to were made under every variety of circumstance, and on a large as well as a small scale, and the results appeared to establish undeniably, a considerable gain in velocity, in facility of working, and in freedom from vibration and noise. The novelty of construction consists simply in the substitution of floats of a trapezoidal form, for the rectangular ones commonly employed, and in the greater narrowness and lightness which can be thus given to the wheel. Mr. Rennie calculates on saving the width of a paddle-wheel in two. The floats may be of any of the trapezoidal forms resulting from the bisection of a cone; but Mr. Rennie prefers the particular form represented in the engravings, in which the diagonals are in the proportion to one another of 1 to 1½, and the greatest of these diagonals is vertical. It may seem paradoxical that a float of half the area of the common rectangular one, should be more effective, but this is accounted for by the circumstance of there being always a greater number of floats immersed at a time in the case of the trapezium wheel. Mr. Rennie contends also, that the differences in the velocity of the inner and outer circles of the wheel, and of the pressure of the upper and lower stratum of the water struck by the wheel, are more equalized by means of the trapezium than by the rectangular float; and this position he illustrates by reference to the wings of birds, the feet of

Fig. 3.



aquatic fowls, the tails of fishes, &c., all of which are of the trapezoidal form. The Admiralty have consented to a pair of wheels on this construction being fitted to the *African*, now lying at the dock-yard, Woolwich; so that we may soon hope to have its working capabilities tested beynd all possibility of doubt.

3. *Conoidal Propeller.*

Mr. Rennie has also recently patented a description of propeller by which he proposes to do away with the common paddle-wheels altogether. It is called, from its peculiar form of construction, the *conoidal* propeller, and may be fixed at the stem or stern, or middle, as well as at the sides of a vessel. Fig. 3 is a side view of this propeller, and fig. 4 a transverse section, It consists of two or more curvilineal leaves or plyers, formed as follows, and attached to a shaft or axis. The curves of which the leaves or plyers should be formed are obtained by causing a tracer to descend the surface of a cone in motion round its axis. Curves so obtained have a constantly varying inclination with their axis, and Mr. Rennie finds by experiment that a shaft with leaves or plyers, formed after such curves, revolves in water with a greater propelling power than any shaft with any other sort of curved leaves or curved surfaces. The conoidal mould on which the lines are so traced, may be of any degree of inclination, from the apex to the base; but he prefers that it should be of such a form that its abscisses shall increase or diminish in arithmetical progression, while its ordinates increase or diminish in geometrical progression. The difference between the screw of Archimedes, as it is called, and the conoidal propeller, consists in this, that the lines of the screw are obtained by the circumvolution of a tracer round a cylinder, while the lines of the conoidal propeller are obtained by the descent of a tracer down the surface of a cone in motion round its axis; and in this also, that the reactive force of the curves in the former case is far greater, and consequently their propelling power much less than in the latter.

IMPROVEMENT IN MR. SMEE'S GALVANIC BATTERY.

Sir,—The very superior galvanic battery recently discovered by Mr. Smee, in which platina is precipitated upon silver, or copper plated with silver, suggested to me the trial of another metal in the place of the silver: but before I give an account of these experiments, permit me to state, that since the appearance of your Magazine containing the directions for making Mr. Smee's batteries, I have had one made and tested it. It consists of 24 silver plates, size, 7 by 10 inches, divided into six elements or pairs, and although finished but a few days since, I have kept it almost constantly in action, and its effect, as compared with the old batteries, far exceeds the most sanguine expectations I had formed of it.

The expense of the plates was great, and recollecting, while preparing them, that iron immersed in a solution of sul-

phate of copper, without any previous preparation, almost instantly becomes coated with that metal, the experiment was made with *iron* in nitro-muriate of platina. To my surprise a coating of platina formed on the iron almost immediately, and with much greater facility than on the silver plates. In consequence a battery has been made of 20 small iron plates platinized, of about 2 inches by 3 in size, and the result is a power every way equal to a battery of silver plates. The process is in both cases the same, excepting the washing the plates with nitric acid previous to platinizing; but the iron does not require one half the time to prepare it, that is required by the silver.

Apart from the comparative cheapness of this battery, many other advantages may be mentioned. In using silver, it being susceptible of action from the mercury used in amalgamating the zinc plates, the electric action projects some particles of mercury from the zinc upon the silver plates, and from this cause their action and effect gradually diminishes. Iron having less affinity for the mercury, than the zinc, is not attacked by it, and no perceptible diminution of its effect or action takes place for hours, and after repeated trials of some hours each, is found to be as good as at the first immersion. The acid used is the same as directed by Mr. Smee, viz.: 1 part sulphuric to 7 parts of water. No porous tubes, canvass or paper bags or sacks are required to preserve the platina.

I have now in progress a large battery of thirty iron plates to be divided into six elements or pairs, my object being quantity rather than intensity. I need not dwell upon the advantages this discovery offers in regard to its cheapness, its freedom from noxious gases, or its equal and constant action. I have only ventured this communication in the hope that others possessing greater experience, science and opportunity than myself, may make still further and more important discoveries.

I am convinced that the *iron battery*, from its many advantages is an important step towards the adaptation of electro magnetism to useful mechanical, as well as chemical and scientific purposes.

I remain, Sir, your obedient servant,

JAMES H. PATERSON.

Paris, May 31, 1840.

ON DR. BLACK'S THEORY OF LATENT HEAT.

Which sets all rules of previous science,
On all such subjects, at defiance.

Sir,—Is there such a thing in nature as latent heat, except electricity? Dr. Black says water contains 810° of latent heat; others say 1,000°.

Either the doctor did not find out all the heat water naturally contains, or others have discovered in it, more than it possesses.

Latent heat would seem to imply a heat that should inherently belong to it, and therefore it would appear difficult to divest it of that fixed or interior principle, which would appear needful to keep it in its natural state.

If that latent heat cannot readily be diminished, it seems quite as impossible that it should be increased.

Water, for instance, is said to owe its natural state of fluidity to its latent heat. In climates where the cold is not intense, that latent heat, as it is called, remains within it, and it continues fluid, but the moment it floats into a colder latitude, this same heat is extracted, it becomes solid, and is only liquified by again receiving as much heat as it had previously lost or parted with.

Water then, in its natural state, the same as all other bodies, would inevitably be solid, if it did not receive a sufficient quantity of exterior heat, to render it fluid, and solid it would continue when it loses it, if it did not again acquire a similar amount.

If, therefore, it acquires heat and parts with it, how can it be said to contain latent heat at all?

Again, it is asserted that water has a latent heat of 1,000°, even when drawn from a well, which heat is *so cold*, that it almost freezes one's fingers, either in winter or in summer; and it is added, that if 212° of *sensible* heat be combined with it, it boils.

At 1,000° it was excessively cold; add a little more than a fifth of its previous *cold* heat, and then it will scald one to death!!

Now, is this theory tenable? The fact is, that the first thousand degrees, if such really exist, must be sensible heat, as well as the 212°, or the water would have been solid.

How can that therefore be termed latent heat, which a trifling change of temperature will either give or take away?

As to latent heat evolved from masses that chemically combine, neither sulphuric acid nor water exhibits any sensible heat in itself, but the moment they come in contact, they are said to disengage their latent heat, and that heat is sufficiently intense to burst a jar or bottle.

Is it not more rational to conclude that, in the act of chemically combining, these two substances attract as much electricity as produces this singular phenomenon of heat, which subsides when their combination is completed?

Again, metals are declared to possess this latent heat, which can either be brought out by friction in rapid revolution, or by hammering, so as to burn or destroy combustible bodies in contact with them.

Now does it not appear rather extraordinary that, although the metal in a quiescent state should be as cold as ice, from its surface to the centre, yet, the moment this friction is applied to it, it should awaken a sleeping heat within it, even to redness, which subsides the moment the cause ceases? Is this not electricity alone?

The same effect is produced when flint is struck against steel. Its latent heat is here said to be evolved; but is not the spark, which appears, absolutely electricity, produced by the friction, and intense enough, instantaneously to melt a visible portion of the metal itself?

Is it not a more reasonable theory to suppose that the friction attracts electricity to the particles in contact, in proportion to the intensity of their action, and as that action ceases, the active supply of electricity ceases also?

If a bar of iron be put into the blacksmith's forge and be brought out red, throwing its scintillations of melted metal in every direction, has the fire it has been immersed in only tended to evolve its latent heat? or has it acquired its tendency to fusion through the medium altogether of sensible heat, which shortly passes away, leaving the said latent heat again dormant and imperceptible?

My impression is, that the iron contains no more heat than is combined with the air that fills the pores, which is of the same degree of temperature as the atmosphere surrounding it and exclusively electrical.

If the sun or any artificial heat warms the iron, which is a conductor, it expands the air within its pores, and this expands its particles. If the atmosphere be cold, the heat in the pores becomes condensed, and the pores of the iron condense or contract in proportion.

Thus all the heat the iron can contain in this state, it obtains from the atmosphere, or other adventitious medium, and possesses no inherent heat of its own; and this appears to me applicable to all other substances, which attract as much atmospheric heat as is requisite to sustain their individual characters, and all surplus tends to alter, decompose or separate their particles.

Again, when rendering metals or other bodies fluid, having different specific gravities, the molecules of super-added caloric have often a great weight to overcome in rising to the surface, but when the bodies are specifically light, the particles of heat ascend freely to the surface and liquify, fuse or evaporate them at a moderate temperature.

When the body is dense, the molecules of heat are unable easily to overcome the superincumbent pressure or tenacity of adhesion, and consequently accumulate at the bottom of the body until it is saturated to the surface, when liquification, &c. is the result.

Therefore the liquification, &c. of bodies at different temperatures is not owing to the rarefaction of the latent heat in the body itself; but to the caloric superadded externally and gradually accumulated therein.

Again, with respect to the substance of fulminating gunpowder. Can it be said that when it explodes, it is only parting with its latent heat?

We find, that if a metal, or any other conductor, were passed through a barrel of this powder, all the electricity that could be forced into it would not call up or awaken the sleeping volcano within it, nor is there, in that case, any visible appearance of any spark of electricity escaping, when it does pass.

Let us, however, take away the conductor, and pass the most minute spark into the barrel, and then see what would become of him who might be venturesome enough to take his seat upon it, which he might safely have done before.

Here, evidently, the electricity effects that which would not have been produced without it, for the gunpowder

would lie in its quiescent state for ages, with all that terrible furnace of latent heat in its bowels!

There seems to me to be an extraordinary inconsistency in the theory which is used to explain, why steam, at a very high pressure, does not scald or injure the hand at its immediate outlet, although it produces this effect when it has proceeded some little distance.

When water is confined in a boiler, and the steam is under very high pressure, that pressure is, of course, in proportion to the quantity of sensible heat conveyed into it through the metal. The greater the heat so infused, the greater will be the distance at which the particles of water will be removed from each other.

Now, the moment these particles escape at the outlet, they will be so greatly separated as to be incapable of conveying intense heat, but the sensible heat which separated them, escaping, they come into much closer contact with each other, form a compacter body, and thus produce all the mischief of boiling water.

The earth, during its diurnal revolution, develops different degrees of velocity at different meridians; that velocity being greatest at the equator, and diminishing gradually as it approaches the poles.

The polaric attraction may therefore be occasioned by the gradual transition from violent rotation at the equator, to comparative quiescence at the poles.

This would also account for the difference of climate under different latitudes. Tropical heat may thus be developed by the activity imparted to the atoms of matter at the equator: polar frigidity, to their comparative quiescence in the highest latitudes.

Thus the electric fluid surrounding the globe seems called into activity from the equator to the poles, where it gradually subsides; because, as six inches at the poles require as much time in performing their circle, as 25,000 miles at the equator, it is evident that a space is passed through of only a quarter of an inch in an hour at the poles, whilst a space of 1042 miles has to be completed at the equator.

It therefore seems reasonable that the friction on the electric fluid at the equator must be 264,084,480 times greater than at the poles in a circle of 6 inches, and that friction must go on decreasing in exact proportion as the circles of latitude decrease, consequently the atmosphere becomes gradually colder in high latitudes.

The origin of solar heat being electricity, it is clear that that electricity must be excited in proportion to the extent and velocity of a body passing through it, and therefore it must consequently be hot at the equator, that heat gradually diminishing to the poles, which, from its cessation, must be abandoned to eternal frost.

If then the sun is the source of light or electricity, latent heat, *properly so called*, is elicited from it by the friction of the earth's motion through it, and is the only heat we can receive direct.

W. A. K.

ON THE PAPER MANUFACTURE—COMPARATIVE MERITS OF HAND-MADE AND MACHINE-MADE PAPERS.

Sir,—It would be a needless piece of affectation in me to attempt to answer the letter of Mr. E. Smith in your last number (page 737, vol. xxxii.) without thanking him for the very flattering and handsome manner in which he has been pleased to allude to my communications.

I should be very sorry to seem to take any advantage of his want of health and leisure to press the discussion of a subject to which he at present declares himself inadequate. As he proposes, however, to take up the matter in detail at some future time, I think a few lines may probably serve to bring the question within very narrow limits.

I readily admit what Mr. Smith requires, viz., "that the fineness of texture, evenness of surface, and firmness of body, no machine paper can equal *the best* writing imperials, demys, &c. &c. which are made by hand;" for confirmation of which, Mr. Smith refers me to "any account-book maker." I beg in reply to state, that I am the son of a stationer and account-book manufacturer of upwards of sixty years standing, and have myself been more or less connected with "the trade" for twenty years. With regard to the *uneven* lot of royal cartridge, of which Mr. Smith says "had it been *sorted* the varying proportions would have proved too heavy

or too light for *the* market. I can assure him *a* market is always to be found for cartridge-papers of all sizes and of all weights, within reasonable limits.

"That there never was *so much trash* of many kinds (of paper) deluging the market as there is now," is true—there never was so much paper sent into the market; but I maintain that whatever may be defects of this "trash," if traced to their real cause they will not be found to be attributable to the *machinery!* Want of proper attention, want of the necessary skill, or want of common honesty, may severally operate to produce bad paper. The cupidity of a manufacturer may lead him to employ an unsuitable material for the basis of his fabric; want of practical skill may lead to so gross a mismanagement of the several manipulations as to injure or destroy the products of even a good material; negligence on the part of the workman may lead to similar results. The paper-maker may give a plausible character for substance to his paper, by the employment of ponderous adulterations, such as clay, chalk, plaster, &c. or by stinting it in size, but all these "defects" are as likely to occur with hand-made, as with machine papers. They depend upon the will of the maker, independent of his machinery, which can neither commit nor correct such errors.

Again, the rapacity of a *publisher*, or the poverty of an *author* (who is alone an object of pity) may induce him to untake a work, for which its own intrinsic excellence will ensure a rapid sale, upon cheap and showy paper, caring not one jot about its durability. Still this does not affect the question at issue, which I fancy may be summed up follows. The *best* writing and drawing papers are those made by hand—good, very good papers, of the same class are produced by machines, while as regards all printing, wrapping, brown and cartridge papers, the best as well as the cheapest are machine-made.

Whenever a manufacturer is actuated by a strong desire to improve the quality of his papers, by selecting good materials, by carefully performing those processes which are purely chemical, and by properly directing and regulating the movements of his machinery—the best results are obtained: and scarcely a year passes by without furnishing fresh proofs of the suprising capabilities developed by, and the immense advantages resulting from the extension and improvement of paper-machinery.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

May 25th, 1840.

ON AERIAL LOCOMOTION.

Sir,—I have read the communication of "Spectator" in your last number, (page 8) with considerable surprise.

Alluding to the mode of propelling balloons which has been lately *resuscitated* by Mr. Green;* Spectator says, this plan "should not be entirely relied upon, as it appears to depend upon manual labour, and the aeronauts ought to be provided with a more certain and effective power." I would only ask "Spectator" to name any mover superior, or even equal, to manual labour, (weight for weight), that can be employed in such a case?

It is true that "Spectator" suggests the employment of kites—not birds, but *paper kites*. He says, "for instance, no one would deny that a *common kite* attached by a cord to the car, or some part of the balloon, would fail to overcome the equilibrium of the balloon's atmospheric balance, and continue to draw it higher up into the air, as long as it was allowed to exert its power." Now, sir, I beg to deny that such could by any possibility happen; so far from a *common kite* being competent to such a task, it would be a most *uncommon kite* that could accomplish so extraordinary a feat. This assortion of "Spectator" goes to prove, that there is much more in the childish sport of kite-flying "than is dreamt of in his philosophy." The next time he sees a chubby urchin raising his paper kite, let "Spectator" watch him closely, and he will doubtless find that the young philosopher will run in a direction contrary to that in which the wind is blowing, until the kite has attained a considerable altitude, when he will, perhaps, stand still. Let "Spectator" enquire of said urchin, why he

* The original employment of a similar mode of propelling balloons, by the late Mr. Tatum, many years ago, was referred to by me at p. 291 of your xxiii vol., now nearly five years since.

does not run in the same direction that the wind is blowing, and with a like velocity? I dare say he will then be told that if he did so, *the kite would fall!*

It is the result of two forces, acting in opposite directions, that the kite is supported in "circumambient air." The resistance of the string on the one hand, and the force of the wind blowing in the opposite direction, striking the kite obliquely, keep it supported in "mid air." But let the kite be attached to a balloon, or to any other body moving in the same direction and with the same velocity as the wind, and then one of the supports being absent, the other becomes powerless, and the kite instantly falls in obedience to the laws of gravity. A kite, therefore, can exert no propelling power, while so situated.

"Spectator" asks, "How is it possible that an aeronaut can effect any perceptible variation in the direction of the balloon from the direct course the wind drives it in?" In answer to this question, I would beg leave to refer him to your xxvi. vol., p. 39, where he will find I have already explained the law of this case upon unalterable bases; and also asserted the possibility of doing all —and even more, than Mr. Green is now so successfully exhibiting at the Polytechnic Institution: and it is no fault of mine that more has not been done towards a practicable demonstration of the perfect possibility of aerial navigation.

Every offer to explain my plans for the accomplishment of this important object has been "politely declined;" without money, friends, or leisure, what can an humble individual accomplish? —nothing.

I remain, sir, yours respectfully,
W. BADDELEY.

London, June 6th, 1840.

WHAT ARE THE PECULIAR PROPERTIES OF CARBON THAT FIT IT FOR BEING THE "SOLID" INGREDIENT IN ALL LIVING MATTER, ANIMAL OR VEGETABLE?—BY HORATIO PRATER, ESQ.

The above question has not as far as I know been answered in any physiological or chemical work. I shall nevertheless not hesitate to attempt an answer.

1. In the first place, the combinations of all carbon and oxygen *are gaseous at the ordinary temperature of the air.* No animal or plant (as far as our present knowledge extends) can live without throwing off *continually*, or nearly so,* a quantity of carbon, and also absorbing or diminishing the oxygen of the air. Now had carbon and oxygen formed a solid (as do boron and silicon, which generally speaking resemble carbon more than any other forms of matter †) then of course life as at present constituted could not have existed at all. And had carbon formed a fluid with oxygen, this condition of things would have scarcely been compatible with life, owing to the constant inconvenience to which all the animal world at least, would have been subject. Man in particular would have felt this inconvenience (probably incompatible with life, from the cold it would be constantly producing) more than other animals, since in him so much carbonic acid of necessity goes off from every part of the *skin* as well as the lungs.

2. But though carbonic acid is not itself a fluid, it is very *absorbable* by water, and by blood and other fluids. This is another property which would appear to be very useful (to say the least) in the solid material of living matter; for when carbonic acid is formed in cavities or the capillaries, it is thus *easily absorbed*, and given out at the lungs as carbonic acid.

This quality of carbon, of forming a gas with oxygen, is very singular in *solid* matter; and solid matter too that in *close* vessels keeps solid longer than any other (for in this case carbon is neither fused, —changed to a fluid—nor dissipated!) With the least, as with the greatest quantity of oxygen, carbon is still *a gas*—in the one case carbonic oxid, in the other carbonic acid.‡ Moreover, so disposed is it to the gaseous state, that carbonic oxid *(containing the greatest proportion of carbon)* has not yet been liquefied, though without reflection, one would, *a*

* *Some* plants *perhaps*, only give out oxygen during the day; but certainly carbonic acid during the night.

† Or, if we compare carbon with the metals which it resembles in some respects, in this it totally fails; for metals in combining with oxygen do not lose their state of solidity. Metals too may be liquefied, but carbon, unless combined with *much* oxygen, as in carbonic acid, cannot.

‡ I do not mention oxalic acid, because in this state carbon is combined with water necessarily, and hence with hydrogen as well as oxygen.

priori, have supposed this to have been more *liquefiable* than carbonic acid.

3. But though carbon and oxygen form essentially a gas, still when hydrogen is united they are again prone to form a *solid*, whether with or without nitrogen. This is another very singular property of carbon, and makes it *peculiarly* fit for the purpose of life. Hydrogen and oxygen alone, or with nitrogen, form only a *fluid*; in the one case water, in the other ammonia and water. But add carbon and the matter will gradually acquire a *solidity*, as we find in the inorganic compound, oxalic acid, just mentioned, but still more pointedly in carbonate of ammonia; and in the *organic* compounds, muscle, tendon, venous matter, fat, membrane, &c. &c. Now as carbon *alone* cannot in all probability be vitalized, so the mixture in question is necessary; for chemical changes are necessary for vital action, and a *solid* or *semisolid* is also necessary for confining these changes within fixed and visible limits; for no mere fluid could be called alive, in the sense we commonly affix to the term life.

Yours obediently,

H. Prater.

P. S.—I have not alluded to the fact that carbon in combining with hydrogen also becomes a gas, because sulphur, arsenic, and some other forms of matter do the same; though they do not become gaseous on combining *with oxygen*. The property of forming a gas with *hydrogen*, therefore, would not seem by any means to fit matter for being the essential *solid* constituent of organic forms, whether animal or vegetable.

The power of conducting electricity which carbon has, is also probably essential to a living solid. But at present we are not certain of this; particularly as the fluids of the body conduct electricity. On the three properties above mentioned therefore, the power of carbon to support vital changes would appear, to say the least, principally to depend.

Extract from another letter subsequently received from Mr. Prater, on the same subject.

Again, if we compare carbon even with phosphorus, sulphur or selenium, in regard to combination with oxygen, we shall find that neither of these is so prone to form a gaseous compound as is carbon. The vapours of phosphorus and phosphoric acids soon condense to solids spontaneously; and though sulphurous acid gas and oxide of selenium exist in the gaseous state, still, neither do sulphuric, nor selenious, nor selenic acids; and if sulphur (for selenium exists in too small quantity) had been employed *much* in living matter, there would have been constant danger of its passing to its highest state of oxidation, and thus speedily destroying vitality. Sulphur and phosphorus are employed in *very* small quantities in the animal and perhaps in part of the vegetable kingdom; and we find them still, almost always when oxidized, in the highest state of oxidation, as in the phosphoric acid of the bones and urine, and the sulphuric acid of the latter; in both which cases they are neutralized by an alkaline earth or an alkali.

If sulphur had been employed, the oxidation, moreover, would have been *too rapid*; and as we see no living matter of which this forms the *main* solid, we may fairly presume that it could not be vitalised as carbon is.* My belief, indeed, is that no other *known* matter could supply the place of carbon in this respect. In life the oxidation must be slow, and performed in the *presence of moisture*; for life is more analogous to fermentation than combustion. And it seems not at all improbable that some of the *infusoria* are actually produced in almost every case of fermentation. Microscopical observers, indeed, tell us that they do not make their appearance in vegetable infusions much before a change almost analogous to putrefaction takes place. Probably this is because they require that some time should elapse before their organisation is complete; for Ehrenbergh has affirmed they have digestive organs, &c. &c.! The change that takes place in fermentation then, rather than that of putrefaction, would appear to give the *first impetus* to the formation of these vital atoms; if indeed, we do not adopt Spallanzani's idea, that they arise from ova floating in the air.

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* Besides, it has no tendency to solidify (if we may so speak) oxygen or hydrogen. It has rather a tendency to beliquefied by these,—carbon quite the contrary.

COOKING BY GAS.

Sir,—Your "Occasional Reader" is not a Londoner, either by birth or residence, nor is he aware of possessing any advantages for obtaining information beyond such as are equally open to your Battle correspondent, who could more easily and certainly procure the opportunities of lectures, &c., by setting onfoot a Battle Mechanic's Institution, or by fostering such an institution if it already exists, than by suggesting that strangers should subscribe to assist in doing what every place ought to do for itself.

I have no wish to be "hard" or *sharp* upon Mr. Weller, but when I see a communication headed "Weller's Gas Cooking Apparatus," with a long description of its various parts, without any intimation of any part of it being borrowed, except perhaps from Mr. Hicks, accompanied by a sketch of what looks like a clumsy imitation of Mr. Sharp's ingenious invention, if I give Mr. W. credit for that honesty of intention, (which we should attribute to all men till the contrary be proved), I have no alternative but to suppose him entirely ignorant of Mr. Sharp's apparatus, and that he really and honestly "imagined" himself to be the Inventor of an apparatus which he calls "*mine*" and "*my own*," and which is introduced to your readers as "Weller's Gas Cooking Apparatus." I did not accuse him of "*pretending* to have invented," but of *imagining* himself to have invented an Apparatus.

I supposed it to be an early attempt of a person following in the same track and actuated by the same motives as Mr. Sharp, but strangely ignorant of what Mr. S. had previously accomplished. I well recollect seeing notices of Mr. Hicks's patent about the time it was taken out, and I afterwards lost sight of the subject for some time; meanwhile, Mr. S. who had long made use of gas for culinary purposes, was labouring to bring his apparatus to the degree of perfection in which it was subsequently offered to the public; and although certain prudential motives and the advice of an experienced patent agent, induced him to apply for licences to use the burners under Mr. Hicks's patent, instead of following his original intention of patenting his own form of apparatus—his claim to originality is not the less strong. To Mr. James Sharp, I consider, belongs the merit of having invented not merely the *first*,* but the *only* really COMPLETE Gas Cooking Apparatus; and I challenge Mr. W. or any other person, to name any cooking apparatus whatever offering so great accommodation at so small a first cost.

It should be borne in mind that the price of Mr. Sharp's apparatus INCLUDES saucepans, boilers, steamers, and all the requisite et cetera for the various operations of cooking: and I doubt not, but if Mr. W. be still desirous to forward the introduction of the best and cheapest form of Gas Cooking Apparatus, he will find Messrs. Thomas Sharp, and Co., of Northampton, perfectly ready to enter into his views, and meet them in every possible way—as it is plainly their interest to do so. Mr. James Sharp has now no interest in the concern, having met the fate so common to inventors—who clearly seeing the advantages of their own inventions, fancying the road to fortune open before them, undervalue the obstacles which habit, ignorance, and prejudice oppose to their success, in addition to those arising from natural causes—and enthusiastically determined that benefits so evident to them shall not be lost to the world—ruin themselves by the energy of their exertions to overcome that which time alone can conquer. He is now, I am sorry to say, in the position of a servant in some provincial Gas Works. I cannot now refer to the numerous notices of his Apparatus in the newspapers and periodicals of the time when he was travelling about the country delivering lectures gratuitously, on the subject of cooking by Gas, with a view to its more general introduction; but I subjoin one which will serve as a specimen of the paragraphs which went the usual round of the papers; it is from the Sun, June, 1837.*

There is also a very nice little book, published by Simpkin and Marshall, 1838, called "Hints for the Table; or the Economy of Good Living." At pages 15, 16 of which you will find the following remarks: "Cooking by gas has already been perfected by Mr. James Sharp, of Northampton; his apparatus consists, &c. One of the earliest specimens was constructed for the Bath Hotel, at Leamington, by which a

* I do not mean to dispute priority with Mr. Hicks, although that might be done; but his Apparatus was crude and incomplete—and all others will be found to possess merit just as they assimilate to Mr. Sharp's, or deviate from it.

* "A lecture was delivered by Mr. Sharp, of Northampton, to the members of the Mechanics Institution, at Winchester, on the process of cooking by Gas. This he explained by means of an Apparatus, in one compartment of which a piece of beef, weighing twenty pounds was roasting, underneath which was a Yorkshire pudding; in another division was a leg of mutton, twelve pounds, also roasting, and some rhubarb tarts baking; in another vessel were a ham weighing twelve pounds, two large plum puddings, a piece of salmon ten pounds, two couple of fowls, and vegetables. At the conclusion of the lecture, the supper was dished up and placed on the table by the ingenious inventor, and partaken of by about fifty of his auditors.

dinner (at a guinea a head) for 100 persons, was prepared by one cook. The economy is great, a dinner for 50 persons having been cooked for seven-pence."

The late Mr. John Barlow was well aware of the advantages of this system, and thoroughly convinced of the excellence of the apparatus he was endeavouring to introduce, yet his success was but partial, having to contend with a variety of opposing powers and circumstances. The cooks viewed with doubt and dislike an innovation which threatened to make their mistresses independent of them. An accidental flaw in a gas-pipe condemned the whole affair as absolutely poisonous, or, if all the pipes and joints obstinately refused to leak, a tap left partially open would often do just as well. Besides, you can make a smoke and mess by turning on too much gas, and declare it impossible to be avoided, though you are sure you take twice as much pains as ever you did with the kitchen fire, &c. &c.

If Mr. Weller will but just try his hand at introducing cooking by gas, he will soon understand the nature of the opposition to be encountered, although from the time which has elapsed, and the lectures and exertions of Mr. Sharp, he will enter the field under more favourable circumstances than did the late talented Mr. John Barlow, under whose auspices, however, the apparatus was introduced into many towns, with the gas works of which he was in some way or other connected. Banbury, Bishop-Stortford, Daventry, Kettering, Leighton-Buzzard, Royston, Leicester, Lincoln, Cheltenham, Oxford, &c. &c., are among the number, and no doubt many more might be added; but these are sufficient to clear him from all suspicion of lukewarmness in a cause of so much importance to all whose interests are connected with gas-works.

I remain, sir,
Very respectfully,
Your "Occasional Reader,"
P. S. O.

RECENT AMERICAN PATENTS.

[Selected from Dr. Jones's list in the *Franklin Journal*, for February.]

Cast Iron Wheels for Cars, &c., *William W. Pennell*.—This wheel is without spokes, one side of it consisting of an entire plate, which is supported by radiating brackets connected with it and with the hub. Towards the rim there is a circular cavity extending all around the wheel, which is formed by a core supported through openings left in the face of the wheel for that purpose.

The claim is to the constructing this wheel and combining the several parts together; "that is to say, in combination, the forming of the part towards the rim hollow, in the manner described, whilst the part towards the hub consists of a single plate, the two parts being connected and supported by brackets, as set forth."

Tanning, *William Brown*.—The improvements are said to consist in the changing the position of hides, sides, and skins, in the liquors, in all the different processes of tanning; viz. liming, bating, and tanning, as a substitute for the ordinary mode of drawing, hauling, and laying away.

The hides, or skins, are to be suspended so as to hang down vertically, and parallel to each other, by taking two pieces of timber and keeping them apart by a stretcher of the proper length for the vat, *a*,|————|*a*, the short pieces *a*, *a* may represent the ends to which the skins are attached, and the long line the stretcher. The workman, walking upon a plank laid along the vat, is to remove this apparatus back and forth, by means of two handles extending up from the end pieces. The claim is to this arrangement.*

New Liquid for Burning in Lamps, *Augustus V. X. Webb*.—The liquid here patented the patentee denominates *Camphine*, or *Camphine oil*, and the patentee says that the nature of his discovery consists in "distilling with potash, or other alkali, and water, turpentine, or the spirit or oil of the turpentine, or other essential oils, whether separate or combined; the results of which distillation is a liquid I denominated camphine." A still is described which is so constructed as to allow only the lighter parts of the fluid to pass over the condenser, and the following claim is then made.

"What I claim as my discovery and desire to secure by letters patent, is the manufacturing of the liquid here denominate camphine, or camphine oil, which is produced by distillation with water and potash, or other alkali, turpentine, or other spirits, or the oil of turpentine, or other essential oils, whether separate or combined, and by whatever apparatus or mode the distillation may be effected."

We do not know of any substantial change that would be produced in the composition of the essential oil by the proposed process, and most assuredly, the process itself of distilling the essential oils from potash and water, has been performed times without number, although not for the purpose here proposed.

Lamp for Burning the Liquid called Camphine, *Augustus V. X. Webb*.—The lamp is of the kind formed by the frustums of two cones united at their edges, so as to

leave the centre of the body free for the descent of the light from the burner; such lamps are in common use. The claims are to "the construction of the burner with a circular and continuous aperture between the upper edges of the frustums, to admit either a continuous circular wick in the form of a hollow frustum of a cone, or a circular perforated ring or plate to be used for burning camphine or any other article." The peculiar form of the glass chimney is also claimed; which form differs but little from those in common use, but possibly it may be thereby better adapted to the burning of the spirit employed, a question to be decided by experience only. There is a claim also to the regulating of the light by the raising or lowering of the chimney.

IMPROVEMENT IN FIRE ARMS, *Libbeus Bailey, John B. Ripley, and William B. Smith.*—The gun which is the subject of this patent is to receive its charges at an opening in the end of the breech. The particular arrangement of its parts cannot be given, these being too complex for verbal description, but the following quotation from the specification will afford some general idea of the general plan.

"This fire arm can be discharged about 15 times to one loading; the operation is as follows:—Fifteen sliding chambers are loaded with powder and ball, and a percussion cap pressed firmly upon each of the cones; these chambers are than passed into the cylindrical conducting tube through the opening at the breech of the gun, and then closed by shutting the cover; the gun is then brought to the shoulder and discharged; the gun is then brought down to a level with the hip, the cock drawn back with the thumb of the left hand, which leaves the drop free; the trigger is then pulled, the bolt drawn back, and the drop falls, and the discharged chamber falls into the left hand, the gun is then turned over with the barrel down, a slight motion will cause one of the sliding chambers to pass from the cylindrical tube into the receiving chamber, the apron, or drop, is then pushed down into its place, and the gun brought again to the shoulder and discharged, repeating the operation until the fifteen charges are expended."

If this gun has not yet followed the course of the numerous "improved fire arms" which have been made the subject of previous patents, it is no doubt on the road. There are few subjects upon which so much misapplied ingenuity has been expended within four or five years, as upon that of fire arms. They have been destined to be the subjects of a *report*, and have then been laid upon the table; and we believe that the single barrelled gun, with its single charge, will not be generally superseded, either for the use of the army or of the sportsman.

REVOLVING FLASHING LIGHTS FOR LIGHT HOUSES, *Benjamin F. Williams.*—The claim made under this patent is to the "rendering the revolving lights of light houses distinguishable from other revolving lights by means of vertical revolving shades, turned by wheels moving on a circular railway to the axis of which the shades are fixed, directly in front of the lights, which, when in motion, will cause the lights to appear and disappear in quick succession of sudden flashes."

TAILOR'S SHEARS, *Rochus Heinisch.*—This improvement consists in widening out and so forming certain parts of the bows of the shears, as to constitute a bearing for the hand in grasping and using them, rendering it more easy to exert the necessary force in cutting. This is, no doubt, a real improvement; the claims are to the so constructing the shears, as described.

PROTECTING PLASTERED WALLS AND CEILINGS AGAINST THE EFFECT OF FIRE, *Peter Naylor.*—The invention here patented consists in substituting perforated plates of metal for the laths of wood usually employed: and I do hereby declare that the following is a full and exact description thereof.

"I take," says the patentee, "thin sheets of metal; preferring, so far as my experience has gone, tin plate, as prepared for the purpose of manufacturing tin ware, as I have reason to believe that the tinning protects the iron completely from the action of the lime used, and from oxidation generally. I do not intend, however, to confine myself in this particular, but to use any kind of sheet metal which I may find adapted to my purpose. When tin plate is used, the distance of the joist, or of the timbers generally to which it is attached, must be within the limits of the length of such plates, but when sheet iron or other metal is employed, the distance may be greater.

"I take the sheet metal which is to be used, and I punch numerous holes through it in the manner of a grater, using either a round, or chisel-edged, punch, as may be preferred; the diameter of these holes may be from an eighth to a quarter of an inch. When the plates have been so punched I nail them on to the joist, scantling, or studs, with the burred edges of the perforations outwards. For greater security I take strips of hoop iron which strips I nail on to the timbers, before nailing the sheet metal, and when this is done it would be difficult to heat the metal through its two thicknesses

sufficiently to set fire to the timber, even without the protecting influence of the plaster.

"The sheets of metal may be seamed together at their edges before nailing them on. When the sheet metal has been properly secured to the timbers I proceed to plaster the walls in the usual manner, omitting, however, the first rough coat which is necessary when laths of wood are employed. The plaster will pass through the numerous perforations in the sheet metal, and will be as securely keyed, and retained in place, as when done in the ordinary way. It has been found also, by experiments carefully performed, that the plaster will not flake off by a long-continued heat so readily as it does from wooden laths, which warp and twist, and thereby aid in loosening the plaster."

NEW TEST LIQUOR FOR ACIDS AND ALKALIES.

From *Transactions of Society of Arts*, for 1839. Part II.

[*The Thanks of the Society were voted to Mr. J. Marsh, of the Royal Arsenal, Woolwich, for his communication.*]

The infusion of the common red cabbage has been long in use in the chemical laboratory, as a test distinguish acid from alkaline bodies when in solution; and, although possessed of great delicacy in this respect, is still subject to an objection, on account of its becoming so exceedingly offensive in its smell, after having been prepared a few months.

In order to obviate this objection, I undertook some experiments, about two years ago, on the colouring matter of the dark red hollyhock, the purple radish, and the dark red beetroot; but, during my experiments, I found many objections to all. The beautiful blue colour of the dark red hollyhock, obtained by alcohol, is however, worthy of notice; but I have not had time to look much to it during my experiments on this subject, my attention being forcibly drawn to the beautifully coloured infusion obtained from the dark varieties of the dahlia, such as the Conqueror of Sussex, Sir Ed. Codrington, Sir E. Sugden, Alman's Splendissima, Parson's Rival, Brown's Ion, Holmes's Rival, Sussex Lima, Metropolitan Perfection, Pasha of Egypt, Robert le Diable, and Sambo,—these being the varieties that I have mostly employed; there are many more equally as good, but they have not yet fallen in my way.

This infusion is easily obtained as follows:—Into an infusion pot, or any common earthen vessel, let as many of the petals of the above-named dahlias be lightly pressed, and then boiling hot distilled or good rain-water, sufficient to cover the petals about an inch, be introduced. The best method of keeping them down is by means of a piece of plate-glass, or the foot of a broken tumbler, or even a piece of common porcelain will do very well. The whole may be kept on the hob of a common fireplace, simmering for two or three hours, covered over with a piece of common paper, to keep out any dirt which otherwise might fall in. The liquor is then to be poured off the petals, which will be found almost colourless. To every pint of the infusion add half an ounce of sulphuric acid, keeping the whole slowly stirred with a slip of glass. When quite cold, add to every pint of the mixture two grains of corrosive sublimate dissolved in a portion of the liquor: filter the whole through a piece of coarse cloth, and bottle it up; and it is immediately fit for use.

When wanted for use, the liquor is to be carefully neutralised by ammonia, which gives it a kind of olive colour, and in this state it may be used liquid; or bibulous paper may be dipped in it, and then dried. Either the liquor or the paper will become green with alkalies, and red with acids.

Being desirous of turning to account some of the qualities of this class of flowers now so much cultivated and so generally admired, and also rendering them useful as well as ornamental, I have made several attempts to fix it as a dye-stuff on cloths, &c.; but have not yet succeeded in my attempts to my own satisfaction.

The great abundance of these flowers, and the ease with which they can be obtained (as they answer every purpose after having been exhibited), together with the simple method of obtaining this test liquor, will, I hope, be thought worthy of the attention of the Society of Arts. In conclusion, I beg to add, it has been approved of and adopted at the Royal Military Academy and Royal Institution; and any further information that the Society may require in regard to this subject, I shall feel much real pleasure in communicating when the Society may honour me with their commands.

I am, Sir, &c.

J. MARSH.

Woolwich, 22nd March, 1839.

London, April 4, 1839.

My Dear Sir,—I have examined the test liquor which you were kind enough to send me, and find it most excellent for the purpose of ascertaining the per centage of alka-

line salts; its extreme cheapness is a great recommendation, as it may be used with more freedom than the litmus, to which, in point of delicacy, it is fully equal.

I am, Sir, &c.

LEWIS THOMPSON.

J. Marsh, Esq., Woolwich.

THE RACE BETWEEN THE "RUBY" AND "ORWELL."

Sir,—As I did not get the *Mechanics' Magazine* of last month till the 6th of June, I had no opportunity of seeing the statement of Mr. Billings before. I was on board the *Orwell* from London, on the morning of the 2d of May, the occasion alluded to by Mr. B., and feel bound to offer a few remarks on his statement. Mr. Billings says at the commencement, "the *Ruby* got under weigh from Blackwall, and proceeded slowly down the river, to enable the *Orwell* to come up, as she was to start from London at eight o'clock." But he gives no reason why she *did not start* at *eight o'clock*. Perhaps he did not know that in consequence of her anchor being entangled with other vessels, we were detained till a quarter to nine before we got away. (The *City of London*, which that day took the place of the *Albion*, was thus three-quarters of an hour before us, and that vessel we passed before we reached Gravesend.) Mr. B. leaves his readers to suppose that the *Orwell* was all this time doing her best to get down the river. When we came in sight of the *Ruby*, we understood she was quite fresh, having been refitted, &c., and intended to challenge us to race with her. Several gentlemen on board, with myself, protested against the *Orwell* being allowed to do so, having no desire to be blown up or drowned; and I do believe she was not put on with much more speed than before, as she was amply laden, having, besides 200 passengers, 50 or 60 tons of goods. The *Ruby* appeared to have eight or ten persons on deck, and no lading. Indeed this is afterwards acknowledged by Mr. Billings, and said to be to her disadvantage. But the *Orwell* was much deeper in the water than was advantageous to her, and was not improved by all her passengers crowding forward to look after the *Ruby*, who was far before us till we came to Gravesend, where she ran in, and again came out. Although, however, she got a-head of us, she did not attempt to go round us, as we expected, and no doubt they intended, had they found it practicable, but sheered off on the same side she came up on.

Such puffing as that of Mr. Billings is unwise. Let both vessels take in equal cargoes according to size, and make the voyage from London to Ipswich, taking the sea and river, and then we may fairly judge which will go the fastest, and keep on best.

I am, respectfully yours,

W. B.

Stowmarket, June 8, 1840.

P. S.—At Purfleet we stopped to take in a passenger, and the *Ruby* kept on; of course Mr. B. should have mentioned this to account for her being "1½ miles behind," as he says she was, though I think the distance was not half that. To a "landsman" it appeared like a light gig, running against one heavily laden.

THE WASH-HOUSE NUISANCE.

Sir,—Very great inconvenience is felt from the steam in wash-houses, particularly in workhouses, hospitals, and prisons. The washerwomen are constantly taking cold, and the steam is very injurious to furniture, particularly iron. Will some of your correspondents suggest a remedy for this difficulty?

Yours, &c.

A DIRECTOR AND GUARDIAN.

NOTES AND NOTICES.

Valuable Secret Lost.—Mr. Eaton, in his "Survey of the Turkish Empire," mentions the following circumstance as having come within his own knowledge:—"An Arabian, of Constantinople, had discovered the secret of casting iron, which, when it came out of the mould was as malleable as hammered iron. Some of his fabrication was accidentally shown to M. de Gaffron, the Prussian chargè d'affaires, and M. Franzaroli (men of mineralogical science), who were struck with the fact, immediately instituted an inquiry for its author. This man, whose art in Christendom would have insured him a splendid fortune, had died poor and unknown, and his secret had perished with him. His utensils were found, and several pieces of his casting, all perfectly malleable! M. Franzaroli analyzed them, and found that there was no admixture of any other metal. M. de Gaffr n was afterwards made superintendant of the iron manufactory at Spandau, where he in vain attempted to discover the process of the Arabian.

Wooden Percussion Plugs.—Captain Norton lately proved, in presence of a Select Committee of Artillery Officers, at Woolwich, the efficiency of his wooden plugs for producing ignition with percussion powder, by inserting them in his percussion rifle-shells, 12 of which were fired at a target placed at 100, and 150 yards, and all exploded.—*United Service Journal for June.*

Proofs of the Danger of Steam Navigation, and the Necessity of some Government Control.—The annual loss of life by disasters at sea, of British sailing vessels, is estimated at 1,000, while, during the 24 years from 1816 to 1840 inclusive, the total number of persons who perished from accidents of all sorts, by steam-vessels, was 461. As 52 to 1! The steamers plying between the ports of London

and other ports, make about 36,400 trips a-year, and the loss of life is not more than 1 in 1,000 trips! After this, who can question the imperious need of a Board of Control, for the prevention of such a *deplorable* waste of life! Or the propriety of granting handsome salaries to the (would be) members of a Board of such *vital* necessity?

The late Earthquakes in Perthshire.—For a month before the commencement of these earthquakes, and for some time after, there had been, in Perthshire, an almost unprecedented quantity of rain, notwithstanding which it was observed of the Erne, the Airdie, and other streams near Stratherne, that they were not flooded as might have been expected. Now, if water percolated to the depth of one mile and a half into the earth's crust, it would, in consequence of the subterranean heat, generate steam, which might readily cause the upheavings in question. It is further worthy of observation, that for a month before the commencement of the earthquakes, the atmospherical pressure was less than it had been for several years, whereby any volcanic forces beneath would be enabled to press or push towards the earth's crust with unusual effect, and thus facilitate the percolation of water through its fissures.—*Mr. David Milne—Trans. Royal Society of Scotland.*

Birmingham Mechanics' Institution—Second Exhibition.—The Committee of this Institution are at present engaged in collecting materials for a second exhibition, which they expect to be able to open to the public during the summer. The excellent arrangements under which the late exhibition was conducted, the great care taken of every article furnished to the collection, and the good effects these exhibitions are calculated to produce, will, we trust, induce the manufacturers and other inhabitants of Birmingham and its neighbourhood to aid the efforts of the Committee, by contributing such specimens as they may consider worthy of public inspection. The Earl of Dartmouth has, we understand, kindly contributed many curious and valuable objects from his private collection, an example which we hope will be extensively followed by the nobility and gentry residing in the neighbourhood.—*Midland Counties' Herald.*

Historical Society of Science.—A new society, under this denomination, is now in the course of formation. The object of this society is to print from the numerous manuscript collections at our universities and other depositories the most important documents, illustrative of the history of the sciences. It is modelled on the plan so successfully pursued by the Camden Society, the entire subscription, which is fixed at the limited sum of 1*l*., being expended solely in the printing of works, to a copy of which each subscriber is to be entitled.

Thames Tunnel.—The Shield has now, we understand, been advanced to within twenty-three feet of its northern termination.

Rate of Mortality among Miners.—From Mr. Blee's Prize Essay "On the Comparative Longevity of Miners," published in the Sixth Report of the Polytechnic Society, it appears that in rural mining districts, such as Gwennap and Illogan, the fatal effects of mining labour do not take place, to any great extent, before the miner reaches the age of thirty. Excluding, then, from the calculation all persons dying at that age and under, the average ages of persons recorded in the burial registers for the parishes of Gwennap and Stythians, during the two first years of the new registration, are —females, 64; males, not miners, 60: miners, 46!—*Mining Journal.*

Anthracite.—There is no humbug in anthracite —but it must be clearly understood—anthracite of the first-rate quality. There is certainly much coal possessing all the peculiar characteristics of anthracite, which is sad rubbish. Besides which, coal not possessing the properties of anthracite, is sold for it by the London coal merchants. Being in London some time since, and requiring a small quantity of anthracite, I went to a coal merchant's wharf, who advertised anthracite for Dr. Arnott's stove. When I saw the coal I immediately said it was not anthracite; the coal merchant replied, Oh, yes it is—it is Welsh coal, and burns without smoke. I asked him if he knew where it was shipped?—he said at Cardiff. Now, anthracite could not be shipped at Cardiff, unless it had been carted many miles over a mountainous road, and from collieries having canals down to Neath and Swansea. Parties desirous of having anthracite should be upon their guard. But the companies who are about shipping it largely should have agents in London exclusively engaged in the sale of anthracite, not allowing it to go into the hands of general coal dealers, where it runs the risk of being mixed with inferior coal from Wales or the North of England.—*T. H. Leighton, Mining Journal.*

Coal in India.—Dr. Hutchinson, of the Madras Artillery has drawn up a report upon the coal fields recently discovered in the vicinity of Mergin, by which it appears that this coal is easy of access, lying at no great depth beneath the surface, so that shafts may be sunk without difficulty. For its conveyance there seems to be every facility, the river being adjacent, and a land carriage of one mile only being required. It is not stated whether the quality of the coal has been tested by experiment, but we presume it to be the same of which Dr. Heifer spoke so highly in his communications. Steamers will begin to ply between the different ports in the Bay of Bengal and the immediate coal depôts between the Presidencies and Suery will be more plentifully supplied and at a cheaper rate. The effect these circumstances will produce on the destinies of India can scarcely be estimated.—*East India Magazine.*

The late Earl Stanhope.—I had the honour of knowing him for some years, and he frequently described to me his intended improvements in printing. One was to make the bottom of the boxes in the cases concave, so that the types should always be convenient for the compositor to pick up; another was to lay four different sized types in the same pair of cases; another to alter the curve at the top of the *f*, and discard its ligatures; another to cast certain logotypes. Some of these were not improvements in practice, and the others, except they had been generally adopted, would have destroyed uniformity in works that were printed in different houses, in addition to the great expense and inconvenience both to letter-founders and printers. In attempting too much, none of his plans were adopted, so far as related to composing.—*Savage's Dictionary of the Art of Printing. No. 11.*

Flexible Stone.—In the Museum of the Asiatic Society at Calcutta, one object of curiosity is a bending or elastic stone. The stone is apparently of granite, is about 2½ ft. by 6 inches in length and breadth, and about an inch thick. This stone, being lifted at one end, yields to the pressure, and from the half begins to bend as it is lifted, and as the lifted end is raised, the bend approaches nearer to the further extremity. On the lifting power becoming relaxed, the stone reverts to its former level.—*Calcutta Journal.*

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 880.] SATURDAY, JUNE 20, 1840. [Price 3*d*.

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HUNT'S PROPELLING AND STEERING APPARATUS.

Fig. 1.

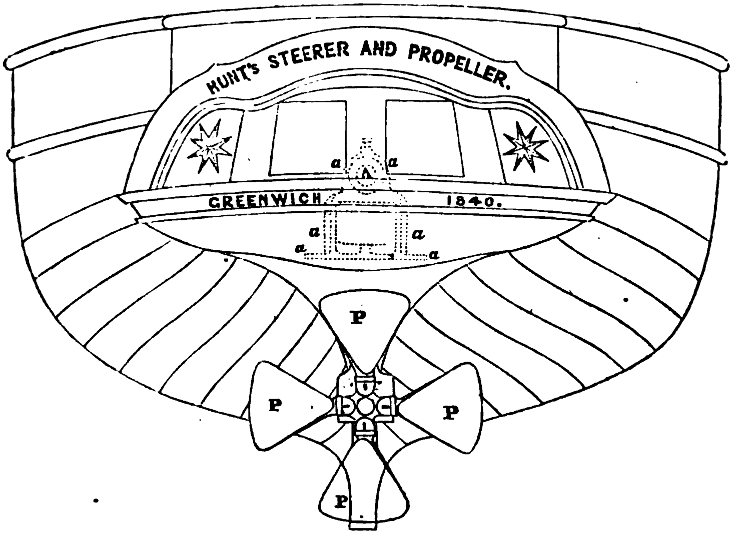
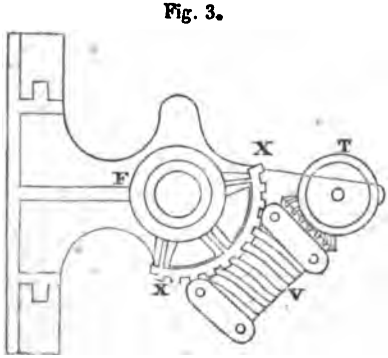


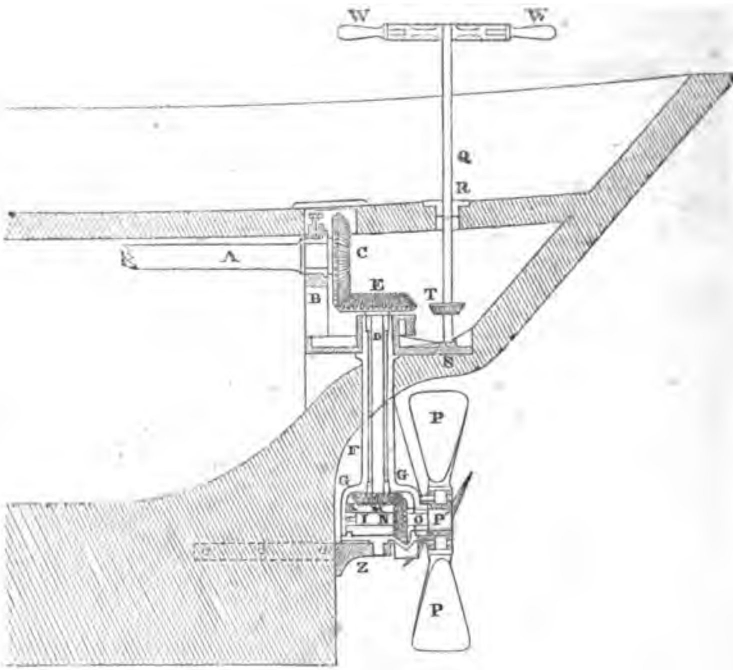
Fig. 3.



DESCRIPTION OF A PROPELLING AND STEERING APPARATUS, INVENTED AND PATENTED BY MR. JOHN HUNT, ENGINEER, GREENWICH.

[Patent dated 23rd November, 1839; Specification inrolled 23rd May, 1840.]

Fig. 2.



The distinguishing feature of this apparatus consists in its combining the two operations of propelling and steering in one. The arrangements for the purpose are extremely ingenious, and from several trials which have been made on the Thames with a boat fitted up on this plan, some of which we have had the pleasure of witnessing, we can testify that they answer most effectually.

Fig. 1 is an external view of the stern of a vessel fitted with Mr. Hunt's apparatus, and fig. 2 is a lateral view of the entire apparatus—partly in section.

The following description we quote from the inventor's specification.

"A is a driving shaft connected in the usual way with a steam-engine or other first mover; A B, an upright bearer on which the shaft A works; C, a bevelled cog-wheel attached to the end of the driving-shaft; D, a hollow vertical shaft (made hollow for the purpose of receiving occasionally a supply of oil to lubricate its different bearing points) which passes down right through the stern of the vessel close to the water line, and reaches outside to near the keel, where it rests in a projecting heel-piece, Z, bolted firmly to the keel or kelson, carrying at top a second cog-wheel E, which takes into the first cog-wheel C, and at bottom a third cog-wheel, M, which takes into a fourth, N, which acts immediately on the propellers hereinafter mentioned; F is a case which encloses the vertical shaft, D, and is connected with it at top and bottom by gun metal bearings; G, a trunk (formed by an enlargement at the bottom of the case, F) which encloses and protects the third and fourth cog-wheels, M and N, and is made of brass or some other metal not readily oxidizable; I, is a short horizontal shaft on which the fourth cog-wheel, N, is fixed, one end of which shaft rests in the bearing, K, inside of the trunk, G, and the other passes through

the trunk, G, into a coupling box, O; P P 1 is a nave or boss at the end of the coupling-box, O, into which are fixed at right angles the one to the other, the four blades or propellers, P, by which progressive motion is given to the vessel. So much of the apparatus as I have hereinbefore described is employed solely for propelling purposes, and its mode of operation is as follows:—The driving-shaft on being set in motion by the steam-engine, or other first mover, turns the first cog-wheel, C, which turns the second cog-wheel E, which (through the medium of the shaft, D) turns the third cog-wheel, M, which turns the fourth or last cog-wheel, N, which turns the shaft, I, which (through the medium of the coupling-box, O, and boss, PP 1) causes the blades or propellers, P to rotate and thereby propel the vessel. The steering part of the apparatus I shall now proceed to describe. W W, are the arms of a steering wheel fixed on the top of a vertical shaft, Q, which passes through the vessels deck, turning freely on its centre in the bearing, R, and resting at bottom in a socket, S. On this shaft a bevilled cog-wheel, T, is fixed, the cogs of which work into a corresponding set of cogs at the end of a horizontal screw shaft, V, which takes into a quadrant, X, (separately shown in fig. 3, but omitted for sake of clearness in fig. 2) which is attached to the top of the case, F, which encloses the vertical shaft, E. It follows from the series of combinations last described, that according as the steersman turns the wheel to the one side or the other, he must turn to one side or the other the quadrant X, which is attached to the top of the case, F, which governs (through the medium of the shafts D and I, and the gear work in connection with them) the position of the propellers P P, and so cause the propellers always to act in a line exactly coincident with that desired to be given to the vessel."

Mr. Hunt adds, that he has tried several sorts of propelling blades, and does not confine himself to any particular form, but that the form shown in the engravings, namely a rounded triangular form, is that which he has found to answer best in practice.

MR. PRATER'S THEORY OF THE INHERENT ACTIVITY OF THE PARTICLES OF MATTER.—REPLY BY MR. PRATER TO MR. WIGNEY.

Sir,—Although very much engaged just now, as I start for a three or four months tour rather sooner than I expected, I shall, nevertheless, trouble you with a few observations in defence of my theory of "Inherent Activity," which I see Mr. Wigney, of Brighton, has attempted to controvert; whether successfully or not I leave the philosophical public to decide.

I shall first say a few words by way of making my views more intelligible; and then proceed to examine Mr. Wigney's objections.

A philosophical friend, to whom I sent a copy of my paper, seemed to object to the term "inherent activity," though not to anything like the extent Mr. Wigney appears to do. The philosopher in question said, all matter seems to have elasticity *when compressed*, and on the pressure being taken off, it, of course, moves. This, I grant; and in all such cases, then let us call the power in question, elasticity, or repulsion if you please. But let us *go further*, and ask *why* it moves when the pressure is taken off? It surely only can be, because it has *essentially* a tendency to "inherent activity," *when not restrained by other forces*. Besides, *it sometimes tends to move when there is to all appearance no compression;* as in powders diffused in water, according to the experiments of Bywater, Brown, and myself; also in some other cases. But leaving all this, the great object of my paper was to apply the fact of *repulsion (if we may so call it) being the cause of the diffusion of the gases*. If any one replies, this is obvious, I shall still maintain that obvious as it is, the idea does not seem to have occurred either to Drs. Dalton, Mitchell, Stevens, Professor Graham, or any one else, as far as I am aware. Dr. Stevens, in his work on the blood, says, the force which makes air or oxygen descend and pass through bladder to displace the carbonic acid confined in a vessel, is unknown; he calls it "latent" attraction, and seems to suppose the air or oxygen to have a power of "lifting up" the heavy carbonic acid, an opinion I have endeavoured to refute in my paper now under consideration,* as all will see who read such paper attentively. Yet merit is due in

* My Experimental Chemical Physiology, published by Mr. Highley, Fleet-street, contains only an allusion to Dr. Stevens's theories on the blood, &c. At the time of writing that book, I had not attended much to the present point. It contains, therefore, only facts and not theories on the "diffusive power" in question.

the matter to Stevens; for as Dr. Dalton discovered that the light and heavy gases mix without any partition by bladder, so Dr. Stevens seems to have been among the first (if not the first) to show they mix also when separated by bladder. Professor Graham's discoveries on this subject have rather a mathematical than a chemical character; and it seems to me that he likewise clearly considered at the time even of writing his "Elements," (not yet finished) that the force which caused the diffusion had not been pointed out. Now the force to which I have attempted to refer the phenomenon, is no mere *imaginary force, created just because it is possible to explain the phenomenon by such supposition* (which mode of philosophizing is adopted too much in the present day, and I think by Mr. Wigney among others); but is a force *proved by experiment to exist in nature*. Philosophers even now-a-days seem fond in *an indirect way*, of the "occult sciences." Like the witches in the play, or the magician of old, "they call up spirits from the vasty deep," and these same spirits fail not to come "when they do call for them," and then mankind learn easily how all the most extraordinary phenomena in nature are brought about. "Occult," and *non-existing* forces are now made to perform the most extraordinary operations; and the Universe is peopled by our modern philosophers with these nonentities. But there is no "royal road" to the mysteries of science.

When I have more leisure I shall look into Mr. Wigney's philosophy carefully, but at present I shall merely notice his objections to my own theory.

Mr. Wigney, in concluding an abstract of his peculiar views, says, "and finally, the expansion *(diffusion)* or contraction of gases is alone attributable to the impartation thereto, or abstraction therefrom, of caloric." *(Mech. Mag.*, June 6th, page 4). Now it is obvious that he here has put in the term *diffusion* as synonymous with expansion; yet this is not the sense in which chemists use it. We all know a gas expands when heated; but when carbonic acid and oxygen or air are merely left in juxta position *(without being heated at all)*, they still gradually mix. How then does the "impartation of caloric" explain the mixture in this case?

Mr. Wigney next alludes to the mixture of chalk and water experiment, and says, there "most probably will be a chemical action"; but a person who has attended to chemistry, knows there is no chemical action in this case. It appears to me, incumbent on those who make such assertions, to make experiments and detail them at the same time, instead of putting forth a loose assertion qualified by the epithet "most probably."

Again, a little further on, Mr. Wigney seems to think that I disbelieve in the *vis inertiæ* of matter, and proceeds to argue as if I did! Now I said no such thing in my paper; I said the *vis inertiæ* is obvious when matter is in masses;* but in proportion as it is divided the *vis inertiæ* seems to diminish.

Again, in regard to evaporation of water, Mr. W. ascribes this to the "caloric transmitted from the sun"; but the evaporation takes place as well by night as by day (though less quickly). But then Mr. Wigney finding the evaporation to take place *in vacuo* still more readily, (as I have so much insisted on in my paper) says, the caloric in this case comes through the glass in proportion as a vacuum is made. *Yet he gives no experiments in support of his assertion;* and so far from the temperature being increased in this case, there seems reason to believe it is actually lower. So far from rising, a thermometer would probably fall when put into an exhausted receiver. Fourier appears to have calculated that the temperature of the planetary space is very much below zero. I only make this remark *en passant*, as I forget the details on which Fourier's assertion is founded.

Again, as to fluids. I have asserted expressly that as compared with gases, the power of inherent activity in fluids is little or nothing. Why then did not Mr. Wigney keep to the point of gases *especially?*

Again, as to the circulation of the

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* Whatley, in his Revolution of Philosophy, also seems to admit it. He rightly says, *heterogeneity* of particles is a cause of motion, and that chemical affinity consequently implies inherent activity in such cases. But he seems not to have been aware of Brown's and Bywater's experiments, or he would have probably arrived at some of the conclusions to which I have come. When I said in my paper (see almost beginning of it) that chemical affinity implied an inherent tendency to motion, I had not read Whatley's pamphlet. He therefore anticipated me in this, indeed, very obvious conclusion.

blood. This, says Mr. Wigney, "Mr. Prater ascribes to inherent activity possessed by such fluid." Now I have not spoken in any such decisive manner as this on the subject, I have merely said the inherent activity of the blood may probably *assist or materially assist* the elastic power of the heart and arteries in supporting the circulation. Those physiologists who have read my work on the blood, will find that I have there noticed Scultze's direct microscopical observations *(not theories)* at length; and though I have hesitated in going all the length he has gone, I have still from *other* direct experiments and observations of my own, come to the conclusion that the blood has *a power of motion of a peculiar character inherent in itself.*

And now, Mr. Editor, I shall leave this matter; and I trust that although my paper "appears, to Mr. Wigney, to be full of error and fallacious evidence," it will not so appear to those who have devoted their attention more especially to the subject.

I should read with satisfaction any *experiments* Mr. Wigney likes to make; but until I am refuted *by experiments* I shall rest perfectly satisfied with my conclusions. As I shall be absent from England three or four months, I shall of course not be in a position to reply to any further comments; and, indeed, I shall not be inclined, unless the assertions are in some degree accompanied, or at least supported, by experiments.

I am, Sir,

Yours, obediently,

H. PRATER.

London, June 9, 1840.

LIFE AND LABOURS OF TELFORD.

NO. VI.

[Continued from vol. xxxii, page 562.]

The Gotha Canal, in Sweden.

It was the fortune of Telford to achieve that *ne plus ultra* of modern ambition, an "European reputation," even long before he had attained to the head of his profession in his own country. This was chiefly owing to his connection with the celebrated Gotha canal, a work of great importance, as uniting the North Sea with the Baltic; and as it was also of a magnitude not so common on the continent of Europe as in our own island, or among our enterprising descendants on the other side of the Atlantic, the consequence was that both the canal and its constructor excited much more admiration among the foreign public, than would have fallen to their share either in England or America. Nevertheless, in any part of the world, the Gotha canal, without taking the highest, would undoubtedly take a very high place among the engineering undertakings of its class.

The city of Gottenburg, which some have called the Liverpool of Sweden, lies at the mouth of the river Gotha, by which it communicates with the great inland Cape Weneru. From the lake to the sea, a distance of 50 miles, the river falls 144 feet, and to facilitate the operations of commerce, two locks were constructed so long ago as about the year 1600, not far from the Weneru, by Dutch engineers, it is supposed under the patronage of John of Ostragothland. But the greatest obstacle to navigation was still left behind, in the shape of the celebrated Trollhatta falls, which, while they formed by far the most romantic and picturesque scenery in the whole kingdom, were unfortunately quite as remarkable for the great obstruction they offered to the passage of vessels up or down the river. In the year 1793, however, a plan was laid before the King for passing the falls by means of an artificial canal, and a Company was formed to carry the project into execution, to whom the two existing locks, at Edit and at Akerstrove, were granted as an encouragement to persevere. A native engineer, Nordwalls, was entrusted with the work, which he succeeded in completing by the year 1800. It consisted of a cut from a small bay above the falls, along a rocky shore to a lake on the same level, from which it decended by eight locks, with an aggregate fall of 112 feet, into the bed of the river at a point much below the falls. There was thus an effective line of navigation completed from the great lake Weneru, westward to the North Sea, an object of no small importance to the trading interests of Sweden.

It was reserved for a fresh actor on the scene to realize the bold idea of carrying this line to the eastward,—a direction in which no natural communication

had ever existed,—and thus to open the chief lakes of Sweden to both of the seas which wash its shores. This individual was Count Platen, a distinguished naval officer, who, on his retirement from his profession, having purchased an estate in the neighbourhood of Trollhatta, and become also a proprietor of the canals, was elected a director of the company. In the course of his duties in that capacity, the Count was soon led to perceive the great advantages held out by a navigable communication between the Weneru and the Baltic, whereby, in case of a war with Denmark, the "Northern Mediterranean" might be entered without the necessity of resorting to the always circuitous, and in that case dangerous, passage of the Sound;—while at the same time an opening would be afforded for the valuable timber which abounds along the line, and the agriculture of the country would be benefited by the facilities given for the transit of lime to all points within reach of the canal. Deeply impressed with the importance of these considerations, the Count lost no time in laying them before the King, and exerting his influence to the utmost to procure them a favourable reception. The result was, that his Majesty (Charles XIII. the predecessor of Bernadotte,) authorized the Count to employ a British engineer to survey the proposed line, and give his opinion on the merits and practicability of the scheme. At this period, Telford's reputation had been advanced so high by the manner in which he had overcome the earlier difficulties in the execution of the Caledonian Canal, that the eyes of Count Platen were naturally turned upon him. However flattered by such a mark of distinction, Telford was so busily engaged at home that he might well have been excused from so arduous an undertaking on the score of want of time, had not his own good wishes for the work, backed by the ardour of the Count, overcome all obstacles. In August, 1808, having obtained a short respite from his engagements here, he accordingly embarked for Sweden, with two assistants, and instantly commenced his task. He remained in that country but two months, re-embarking for England in the October following; but in that short time he had fully completed the proposed examination, marked out a line for the canal, and matured a plan of operations, to serve as a basis for the practical working of the project,—a matter not so easily arranged in Sweden as in Great Britain. All this he laid before the king in an elaborate "Report."

From this Report it appeared that the formation of the country through which he proposed to conduct the line was singularly favourable. The two lakes, Unden and Wicken were so situated, precisely on the summit level, as to serve the purpose of natural reservoirs, and thus do away at a stroke with one of the greatest actual difficulties of canal making. Again, the whole country between the Weneru and the Baltic, were composed of a succession of valleys, either occupied by lakes possessing a sufficient depth of water for the intended navigation, or ground exceedingly well adapted for excavation. On the whole, Telford did not hesitate to declare that he had never met with a line of country gifted by nature with greater advantages for the purpose, or in which so few, or so unimportant obstacles to its execution occurred. In the course of his survey, he made use of the assistance afforded by the levels taken on a former occasion, under the direction of the celebrated naturalist Thunberg, (having tested them and verified their general correctness,) and he also availed himself of a line which had been set out by Swedish engineers, giving the benefit of his experience by pointing out wherever a deviation could be made with advantage. The first great variation he suggested, was at a spot where, shortly after leaving the Weneru, it was proposed to ascend among a range of rocky hills by nine locks placed at equal distances. Instead of this, Telford continued his line in the valley, and then ascended nearly at once, by ten locks placed close to each other. Altogether, the difference of level between the Weneru and the summit of the canal in Lake Wicken, was overcome by means of twenty locks, eighteen of eight feet rise each, one of nine feet, and the remaining one of eleven; in the aggregate, one hundred and sixty-two feet. From hence the line passed through Lake Wettern (the great companion lake to the Weneru,) and the smaller Lake Boren, after which the descent commenced, the level of Lake Roxen being reached at once by means of fifteen closely-consecutive locks of nine feet fall. From this point an an-

cient canal, made, according to tradition, by Bishop Brask, remaining still in existence, Telford proposed to make use of it as far as practicable, a distance of about fifteen hundred yards. After this he reached Lake Asplangen, by means of locks with a fall of twenty feet, and from this lake the line extends to the Baltic, at Saderkossing, with a fall of eighty-nine feet. This of course was the terminus of the work.

To leave nothing unprovided for, Telford furnished the plans for a sea lock, with the accompaniments of a basin, wharf, and docks, to be erected at Soderkoping, for the accommodation of the commerce which it might naturally be expected would be attracted to the spot; and his report concluded by pointing out the immense natural advantages possessed by Sweden in the abundance of its inland waters. Lake Unden, he observed, would of itself supply an abundance of water for all the purposes of the canal, but if properly economized in the manner he proposed, a great surplus of power might be obtained in that and the other lakes, applicable without further expense, as the motive power of machinery to almost any extent. In this respect, however, Telford's plans have remained unexecuted, and the Swedish "water-privileges" have never yet entered into competition with the mighty power of British steam: but the canal itself was forthwith determined upon, and operations commenced with remarkable spirit. Count Platen became chairman of the company; subscription books were opened in May, 1810,—they rapidly filled,—and immediately after ground was broken, and the works were begun.

In 1810, the number of workmen employed was a thousand; in the next year, when the excavations were further advanced, they were increased to five thousand; in the two following years, to 6,300 and 7000 respectively; but in 1813, in consequence of the war, the number was necessarily reduced to three thousand. In the August of this year, Telford paid a second visit to Sweden, and personally inspected the excavations in progress, and gave his directions for their further prosecution, on the scene of action itself. He took with him on this occasion from England several experienced lock-builders and earth-workers, whose assistance was essential in expediting operations to which the labourers of Sweden were comparatively unaccustomed; and previously to this he had, with the permission of our own government, furnished patterns of the tools and machinery used in canal digging in this country. From 1813 to 1829, Count Platen regularly transmitted an annual report of the progress of the works, for Telford's approbation; and in the latter year the whole undertaking was completed, the opening of the navigation being celebrated with great splendour and rejoicings.

The Gotha Canal has probably answered every purpose of its construction, regarded as an interior communication; but it seems to have had very little effect, if any, on the navigation of the Baltic, as that sea is still regularly entered, in spite of all its drawbacks, by the way of "the Sound." In this respect, the Gotha Canal resembles many others of its brethren which have been constructed for the purpose of superseding a circuitous natural communication. The Caledonian Canal is a pregnant instance, nor should the canal of Languedoc, be forgotten, which was intended to save some hundred miles of dangerous navigation in entering the Mediterranean, and to render the Straits of Gibraltar a sort of disused thoroughfare. There would seem to be some fixed though obscure principle opposed to the success (apparently so certain) of such undertakings, whether the scale be large or small, since even our own City Canal, which was to have saved the trade of London the mile or two lost by rounding the Isle of Dogs, has shared the common fate, and, after a few years' hopeless struggle with the longer, but more open Thames, has been converted into a dock, and entirely lost the character of a passage for ships. Whether the grandest possible work of the kind,—a canal through the Isthmus of Panama, would yield obedience to this mysterious law, and have no effect on the tedious difficulty, and perilous passage round Cape Horn, remains to be proved;—and it may be hoped, that ere long, the trial will be fairly made.

On the completion of the Gotha Canal, two sets of large medals were struck to commemorate the event, copies of which were presented to Telford in gratitude for his valuable assistance. One of these

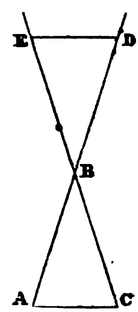
having a head of Charles XIII. on the obverse, bore on the reverse a special inscription:—"Till Tho. Telford, Com. af W. C. Led. af W. A. för Werksamt Biträde till Hafvens Förening. Gifven af Gotha Canal Bolag."* He was also honoured with a Swedish Order of Knighthood, accompanied by a portrait of his present majesty (Carl Johan, alias Bernadotte) set in costly diamonds. It might not be worth while to notice these marks of distinction, were it not for the fact, that they, with a similar one from the Emperor of Russia, seem to have composed the sum total of public honours ever conferred upon Telford, by all the countries in the world, *not excluding his own!*

NEW PROOF OF THE FIFTH PROPOSITION OF THE FIRST BOOK OF EUCLID. BY WILLIAM S. VILLIERS SANKEY, ESQ., M. A.

Sir,—The well known difficulty which attaches to Euclid's demonstration of the 5th proposition, 1st book of his Elements, presents an obstacle to the progress of the young mathematical student, the more discouraging as it offers itself at the very commencement of his geometrical studies. Hence different solutions have been proposed with a view to facilitate the tyro's passage over this *pons asinorum*. The demonstration of Playfair, viz.: "that there is nothing in the *conditions* of the proposition why *one* angle should be *larger* than the *other*, therefore they must be equal," though perfectly true, as based upon the theory of *functions*, cannot be considered satisfactory in a *geometrical* point of view. Another proof is obtained by supposing a line drawn, bisecting the vertical angle to the base, and thus dividing the triangle into two triangles, which answer the conditions of the 4th proposition, and so afford direct proof of the *equality* of the angles at the base. This proof, however, is objectionable on the plan of Euclid's arrangement, which requires us *first* to be able *geometrically* to bisect an angle. Though it must be admitted that the *cogency* of the proof is the same whether we know *how* to bisect the angle or not, as it depends *solely* on the *fact* that there must be *some* line drawn through the vertex which will *bisect* the angle. Equally objectionable is the proof which is derived from supposing the given isosceles triangle to be reversed and transferred to a different part of the diagram, so as to have two triangles with two sides in the one equal to two in the other, and the contained angles equal.

Under these circumstances I propose the following proof, which requires only a slight alteration as to the place of the 13th and 15th propositions of this book, so as to give them precedency *before* this 5th proposition. Based indeed as they are, solely upon the *definition* of a right angle which, is in fact $\frac{1}{4}$th of the aggregate angles *round a point*, they ought properly to occupy the first place among geometrical propositions.

Premising this, the proof will be as follows:—Let A B C be an isosceles tri-



angle. Through the vertex B let the side A B be indefinitely produced, and on the produced part let B D be taken (by Prop. 3rd, Book First) equal to A B or C B. In like manner through B produce the side C B, and on the produced part take B E equal to C B or A B, and join E D.

Now we have thus two triangles, A B C and D B E with two sides in the one equal to two in the other, viz.:— A B = B D, and C B = B E, and the angles at B equal, as vertically opposite (according to what is numbered 15th Prop. but now brought forward by me before the 5th Prop. as involving no principle dependent on 5th Prop.) therefore the angles at base are equal (Prop. 4th) therefore B A C = B D E. Again, comparing these triangles in a different arrangement of their sides, we have the side A B = B E, and the side C B = B D,

* To Thomas Telford, etc. etc., for active services in the Union of the Seas. Presented by the Gotha Canal Company.

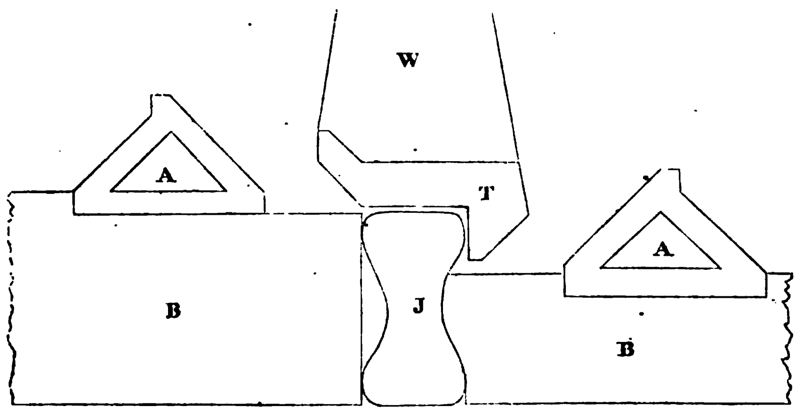
and the vertically opposite angles at B equal; consequently the angles at the base *corresponding to these* sides as *now* compared will be equal, therefore the angle B C A= angle B D E, but in the former comparison of the triangles we proved the angle B A C=angle B D E; therefore as the angles B A C and B C A, at the base of the isosceles triangle A B C, are both equal to the same angle B D E, they are equal to one another. *Q. E. D.*

Producing the legs we can prove the angles below the base to be also equal, as being supplements, to the equal angles above the base, to two right angles (by 13th Prop. brought forward).

The correctness of the foregoing proof is obvious, as the construction and demonstration flow directly from the *conditions* of the proposition, namely the *equality* of the sides of the isosceles triangle.

30, Harmood-street, London.

PLAN FOR PREVENTING RAILWAY CARRIAGES GOING OFF THE LINE.



Sir,—Having contrived a plan to prevent carriages on railways from getting off the rails, and believing it to be completely efficacious for that purpose, I am desirous of submitting the same to the notice of such persons who may feel an interest in the security of railway travelling, and to accomplish that end I know of no better mode of recording such invention, and testing its merits, than to submit the same to you, and should you deem it of sufficient importance to give it a place in your valuable and widely-circulated Magazine, I feel satisfied the same will receive the consideration of such of your scientific readers, as will either cause the plan to be tried, and thereby establish the utility of the invention, or set at rest the sanguine expectation on my mind, that if it were carried into effect on the whole of a line, but more particularly over viaducts and embankments, it would be the means of averting, at some period or other some very frightful accidents.

The above sketch, I imagine will sufficiently explain the invention. I have given a section of one rail only with the protectors and a part of the carriage wheel; I do not pretend to point out either the strength of the castings or the frequency of the bearers on blocks, or the mode of fixing them. One thing, however, is evident, that the protectors and rails must be bound firmly together and made as one, to resist any lateral strain, or blow that may be given by the carriages being displaced from the rail. The principle I wish to attract attention to is the bevel on each side of the tire of the wheel and the bevel of the protectors, each of which are at an angle with the horizon of 45 degrees; so that on any casualty causing the wheel to get out of its place, as much as the breadth of the rail, the bevel of the wheel coming in contact with the bevel of the protector with centrifugal force, will cause the wheels after a few revolutions to settle again in their right place on the rails,

and probably without the passengers being aware there had been any deviation. It will rest with experience to determine whether the bevel of the protectors and on the tire of the wheels on one rail will be sufficient security, or whether both rails on each line must be so guarded; the impression on my mind is that one rail will be sufficient.

There are other points connected with the plan that may be serviceable besides the security gained upon any increase of speed; such as the application of the principle to the switches. The hollow in the protectors may be also made available for purposes of signalizing from station to station, if laid down the whole length of a line, and for lighting the same with gas, &c.

I am, Sir,
Your obedient servant,
FRANCIS PINNEY.

Llangollen, April 7, 1840.

Description of Engraving.

The figure prefixed represents a section of a rail, tire of wheel, and protectors, on a scale of one-fourth the actual size.

A, A, are the protectors to be made of cast iron, and hollow in the centre; B, B, bearers; I, the rail; T, the tire of the wheel; W, part of the spoke of the wheel.

BLEACHING PROPERTIES OF THE CHROMIC SALTS.

Sir,—You will oblige me much, by giving insertion to the following statement of facts in your valuable publication.

I do not wish, by thus publicly putting forward my claim to the merit of having discovered the bleaching powers of the chromic salts, when decomposed by certain acids, to depreciate the value, or deprive the talented Professor Watt, of the honour or benefits accruing from his patent, for bleaching and refining oils, &c., more particularly the bleaching of palm oil, so extensively used in the soap manufactories.

In September, 1834, Mr. John Holmes directed my attention to the latter object; soon after which time I commenced a series of experiments, assisted by him, at the laboratory of Messrs. Jas. N. Holmes and Co., of Paul-street, which were continued for about three months without much success; indeed we were on the eve of abandoning the adventure, when to our surprise and gratification, we discovered the new bleaching agent by the decomposition of the chromic salts.

Towards the latter end of January, 1835, from a quantity of palm oil submitted to that bleaching process, a quantity of candles was moulded, which were perfectly white, and were burned in the presence of several gentlemen at the office.

We also made a small boil of soap, which fully proved the superiority of the discovery over the many plans then in use for bleaching palm oil. I tested other oils by the new process, and found its success equally good. A sample of linseed oil was bleached for a gentleman in the trade, who declared it to be the whitest that had ever come under his inspection.

It would be tedious to enter into the detail of the particulars of the many experiments that engaged my attention on this subject; suffice it to state, that I claim the honour (if any) of having discovered the bleaching properties of chromic acid, and its various salts, by decomposing them with certain acids; and the application of the same to the bleaching of palm and other oils.

For corroboration of the preceding statements, I can refer to the following gentlemen, residents of this town,

ISAAC HOLMES, Esq.,
JAS. N. HOLMES, Esq.,
EDWARD DAVIES, Esq.,
ANDREW GILLON, Esq.

And JOHN C. THOMPSON, Esq., solicitor, with whom I deposited a sealed instrument, describing the discovery.

In conclusion, I may observe that I was not aware of Professor Watt's patent until within the last four or five months.

I am, with much respect, your most obedient and humble servant,

PETER WARD.

Vauxhall Road, Liverpool, June 10, 1840.

CURTIS'S IMPROVED RAILWAY BOLSTER.

[Registered under the provisions of the Designs Registration Act, June 4, 1840.]

The bolster represented in the engravings opposite, is another production

of the fertile genius of our intelligent and indefatigable correspondent, Mr. W. J. Curtis, C.E. It is principally designed for rails laid upon longitudinal bearers or sleepers, such as those of the Great Western and Croydon Railways. The screws are applied to the outside of the flange of the rail, and pass through a washer which clips the rail on the upper side, and then through the bolster, the lip of which passes *under* the rail; a portion of the bolster, equal to the thickness of the lip, being let into the timber, as shown in fig. 1, where A is a section of a rail, B the timber, C′ a side view of a bolster, C a bolster shown in section, E E the washers, and D D screws or bolts. Fig. 2 is a plan of the bolster by itself. Fig. 3 a plan of a joint bolster, and fig. 4 a side view of the same.

Fig. 1.

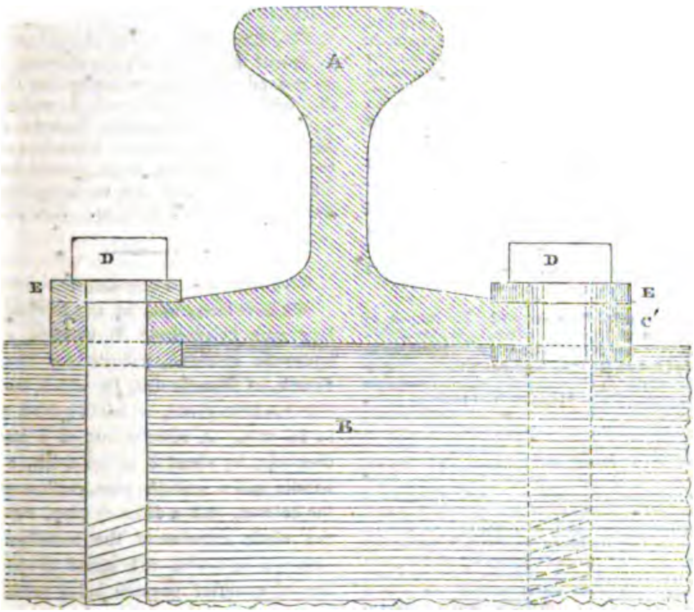


Fig. 2.

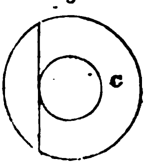


Fig. 3.

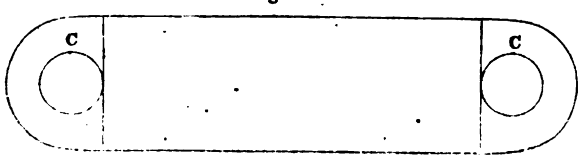
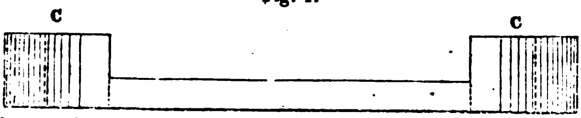


Fig. 4.



The relative positions of the bolster and washer may be reversed, so that the washer may be under the rail and the bolster uppermost; a bolster may also be used by itself without the washer, and without a lip passing under the rail; but neither of these are variations which Mr. Curtis would recommend. What he prefers, and claims under his registration right, is the bolster of the peculiar configuration represented in the engravings, which clips the rail, and is let into the timber-bearers or supporters. The bolster may be either of iron or any other suitable metal.

MR. DELBRUCK'S AUTOGENOUS SOLDERING PROCESS.

Sir,—I have just read in No. 876 of your journal Mr. Spencer's communication on the "theory and practice of soldering metals," to which you have kindly subjoined the following note:—

"Mr. Spencer * * * informs us, that he had given notice of his intention to read this paper to the Liverpool Polytechnic Society as far back as the first of February last, and had previously made no secret of the process it describes; while the similar process of Mr. Richemont was not made public till two months later, when the first detailed account of it appeared in our pages (see No. 872). Mr. Spencer, however, while thus asserting his own claims to originality, very frankly and honourably adds, that he has no 'doubt whatever Mr. Richemont made the discovery first,' and that he has no wish or intention to interfere with the rights of the English patentee, Mr. Delbruck."

Such a frank and honourable declaration would have rendered any reply from me uncalled for, had I not perceived on reading the paper of Mr. Spencer itself, something which appears to amount to nothing less than a strong invitation to a piracy of my patent rights. Mr. Spencer says—

"I had proceeded thus far with this branch of the subject, when I gave our secretary notice of this paper: this is now three months ago. Previous to this period I detailed the principles of the process to a number of individuals, many of whom are members of this society. I also detailed it to persons practically engaged in business requiring the process, and requesting them to give it a trial. I mention this because the same principle has, within the last three weeks, been patented by a French gentleman, who has received, in consequence, some very high honours in his own country, and taken out a patent in this. *I very much regret the latter*, as my own intention was to publish it at once; and as it is, I am *not sure that it can be sustained*, I having detailed my process to so many before his specification was made public. I shall, however, take no steps in it myself, as I never meant to profit by it in a pecuniary sense; my present object being to redeem the pledge I gave the society to read the paper. *I shall, however, be most willing to give the required information as to the amount of publicity I gave it, to any who may be desirous of using the process free of the patent restriction.*"

I shall say but few words in answer; but I hope they will be sufficient to rectify Mr. Spencer's notions as to the validity of my patent, and prevent him from misleading, unwillingly, no doubt, people who might not possess the same *honourable* and *disinterested* feelings as himself, and whom (if they persisted in any infringement of my patent right) I should be obliged to prosecute.

My patent for England was sealed as far back as July, 1838, (nineteen months before Mr. Spencer's paper had even an ideal existence,) and the specification duly enrolled. I will add, though hardly necessary, that the date of the communication you made to the public (No. 872) has nothing to do with the date of my legal rights, as Mr. Spencer seems to fancy, and that the specification comprehends, not only the process described by that gentleman, but several others.

Private affairs, which detained me on the Continent, alone prevented my bringing this invention earlier before the public; but I am now happy to say, I have every reason to believe, from the numerous applications I have already had, it will meet with complete success.

I am, Sir,
Your obedient servant,
CHARLES DELBRUCK.

311, Oxford-street, June 10, 1840.

[We think it but fair to state, that in our judgment Mr. Spencer's experiments furnish no ground whatever for impugning the validity of Mr. Delbruck's patent; and we cannot help regretting that Mr. Spencer, after so honorably disclaiming for himself every intention of disputing them, should have offered any thing like the encouragement he has done to others to do so. ED. M. M.]

IMPERIAL ROTARY ENGINE PUMP.

We have lately seen at the Adelaide Gallery and Polytechnic Institution, a little hydraulic machine, patented by Mr. J. S. Worth, of Manchester, to which the above title has been given, which is quite a wonder in its way. A circular box of 7 inches in diameter, by about 2 inches thick, a winch handle and a suction pipe, with a valve at the bottom, and a delivery pipe, constitute the whole exterior of the machine. The principle on which it is stated to operate is that of a *perfect vacuum* being produced in the box, though by what particular means this is done we are not at present informed. If one may judge of the vacuum obtained, however, from the results, it cannot fall far short of the perfection claimed for it. The pump discharges a *continuous* stream of water, at the rate of about 25 gallons a minute, and that with such ease that a child can work it. It acts both as a lift and a force pump; its powers of lifting are of course limited to the height to which water will rise *in vacuo* (say 28 to 30 feet), but its forcing powers are limited only by the extent of the power employed, and the strength of the materials. For domestic purposes we should think this pump will be found particularly valuable, as water may be forced by it to the uppermost story of the highest houses, with the utmost ease. We hope soon to be able to

lay before our readers a description of the interior construction of the apparatus, and shall then advert more at large to various other important purposes to which it is applicable.

MR. HALL'S SYSTEM OF CONDENSATION.

Sir,—I trust to your impartiality to allow me a small space in your pages to reply to the ten mortal colums which "Scalpel" has inflicted on your readers. He states that he has been thus diffuse in order to render the subject intelligible to *non-professional readers*. But for this explanation I should have thought that his object was to throw dust in their eyes, and even now I fear they will exclaim with the *critic*—"the interpreter is the hardest of the two."

"Scalpel" appears to be labouring under a morbid anxiety lest the fame of Watt should suffer diminution by the introduction of Mr. Hall's condensers, but if he had well considered what is the grand discovery upon which that fame rests, he might have spared himself the labour of writing, and your readers the labour of reading his prolix epistle. The invention by which Mr. Watt's name is immortalised, consists not in effecting the condensation by injection instead of by surface, for both of these methods were known "in the dark ages of the steam engine," but it consists in the employment of a *separate condenser;* and until such condenser be proved to be a blunder, and until the condensation be again effected in the steam cylinder, the name of Watt will continue to command our admiration. In the meantime any improvement based upon Mr. Watt's invention, so far from detracting from his merit, is rather to be considered as a tribute to it, and we may say of Watt, (with a slight alteration) what Falstaff says of himself, that he "was not only an inventor himself, but the cause of invention in others."

"Scalpel," however, appears to view the matter in a different light, and to consider it a kind of *lésé-majesté* for any one to attempt any improvements beyond those achieved by Watt, or at least that they are only to be permitted to occupy themselves with such points as he deemed beneath his notice, but on no account to meddle with any thing which had occupied any portion of his attention. But upon this principle, how is it that he allows those sinners of the first magnitude—the Cornish Engineers to escape, who not merely imagined that improvements were possible in the pumping engine, which for years had exclusively occupied Watt's attention, but had the audacity or impiety actually to obtain by their improvements more than double the effect attained by Watt—thereby committing a flagrant trespass upon Mr. Watt's manor as marked out by "Scalpel." Mr. Hall, on the other hand, merely ventures upon the waste or unoccupied ground which "Scalpel" has so generously left open to the public (for it would be difficult to point to a single improvement in steam navigation which has originated with Watt) and yet "Scalpel" can be silent upon the sins of the Cornish men, whilst he pours out the vials of his wrath upon the head of Mr. Hall—

"Dat veniam corvis vexatque censura columbis."

"Scalpel," at his outset indulges in a sneer at those "highly respectable persons," who, having given testimonials in favour of Mr. Hall's invention founded upon their personal observations, do not forthwith drop their pretensions to the title of *engineers;* and he is particularly indignant with Messrs. Lloyd and Kingston, who, being appointed to examine the invention, reported, that as regarded the main object in view, viz.: the prevention of the incrustation of the boilers, it was "so successful as to leave nothing to be wished for;" this he terms "arrogantly venturing to set a limit to the human intellect;" yet he himself in another passage, "admits at once that Mr. Hall's plan prevents the incrustation of the boilers, and thereby saves them." As to the testimonials, he doubts not that they were honestly given, "and that the invention may have worked well when the machinery came quite fresh from the maker's hands," and having made this admission, he denounces the invention as "one of the grossest and most costly delusions," and undertakes to prove that the *principle* itself is erroneous, and that it cannot possibly work well. In the execution of this task, he says he "shall first investigate the principle of condensation, then show its application."

There are two modes, he tells us, of effecting the condensation; 1st, that by injection, and, 2nd, by surface. As regards the first mode, there is *only one* disadvantage for marine engines, viz.: that the boilers become encrusted, require chipping out, and are rapidly destroyed, to which *only disadvantage* he adds a second, viz.: an increased consumption of fuel. But these trifles, notwithstanding, "Scalpel" pronounces it a most efficient process, and is angry that it should be "so much abused." As regards the second plan, by which the aforesaid *only disadvantages* are as he admits, completely obviated, its disadvantages, are "legion," and he hopes to show that a vacuum of 27 inches obtained by injection, is superior to

one of 30½ obtained by surface. A flourish about the value of the correct deductions of the exact sciences leads the reader to expect some rigorous demonstration of this proportion, but instead of that we have the argument of authority. Mr. Watt, he tells us, tried both plans, and abandoned the latter, and therefore he asks, "are we not justified in assuming at the outset without *any* further inquiry—that it *must* have some inherent defects. Can we, as reasonable men, suppose, that if an honest efficient cylinder vacuum of 30 inches was to be obtained by surface condensation, Mr. Watt in his numerous experiments would not have obtained it as well as Mr. Hall, and that if obtained, he would have thrown it aside for one of 27 and 28?" As nature is constant in her operations, and cannot be supposed to vary them to favour Mr. Hall or to thwart Mr. Watt, we may conclude, that if Mr. Watt did not obtain a vacuum of 30½ (which "Scapel" does not question that Mr. Hall obtains,) he cannot have employed the same means; *perhaps* he did not employ sufficient surfaces; but no, this cannot be the reason, for one of the objections which "Scalpel" urges against the possible efficiency of Mr. Hall's plan is —the great extent of surface he employs! The Irishman who slept with a feather under his shoulder, to give him a notion how a feather bed would suit him, exclaimed, "if my shoulders ache by sleeping on a single feather, what must theirs do who sleep upon a bag full;" in like manner argues "Scalpel." If Mr. Watt, with a moderate extent of surface found the condensation slow, what must it be in Mr. Hall's condenser of 14 miles.

Conceiving that the reference to Mr. Watt's practice is conclusive of the question, "Scalpel" says "here, Sir, I might fairly stop;" but he only says so, to tantalize his readers, for after raising their hopes that he is about to conclude, he starts off afresh, and holds out for three pages more. The argument of authority is followed by a "*petitio principii.*" "Can any one acquainted with the nature of steam really believe that this vacuum is an efficient vacuum under the piston of 30½ inches? Can they really believe that steam is so rapidly absorbed by pipes, &c.? Do they not know, &c.? "Having *thus* explained the principles of condensation," he proceeds to examine whether the means employed by Mr. Hall for the instantaneous reduction of the steam, and its immediate removal can be as efficient as Mr. Watt's plan, and tell us at once, that instead of "a very considerable increase of power," as insisted on by Mr. Hall, there *must* be a loss on account of the slowness of the process. I shall not, however, detain your readers by attempting an answer to his "unanswerable" arguments on this head, since, in the face of his admission, that the "invention works well enough," they can only prove that it ought not to work well. "The great Hermes pronounced that nothing on earth could save Zadig—he even foretold the day and hour of his death—in two days the abscess broke, and Zadig recovered. Whereupon Hermes wrote a pamphlet, which he circulated throughout Babylon, proving that Zadig ought not to have recovered; Zadig did not trouble himself to read his learned lucubrations, but went to visit his mistress." I should, however, remark, that "Scalpel" argues upon the supposition, that the vacuum in steam engines is caused by the air pump drawing off the steam.

Fearing that I may have already encroached too much upon your columns, I shall limit myself to briefly noticing a few of "Scalpel's" misapprehensions or misrepresentations before I conclude. "Scalpel" gives your readers to understand, that the space occupied by Mr. Hall's apparatus in the *British Queen* and *India*, is in addition to that which the engines would occupy. I cannot speak as to the *India*, but with regard to the *British Queen*, I can safely assert that the engines occupy not one inch more space with Mr. Hall's apparatus than they would require upon the ordinary construction; with regard also to the alleged increased distance of the air pump and condenser from the cylinder, upon which he lays so much stress, these stand in precisely the same position as in the ordinary construction, and their distance, therefore, the same as in the ordinary construction.

As to the effects of expansion and contraction, "Scalpel," who affects to know so intimately the details of the construction of their apparatus, must be aware that this is effectually provided for, and the best proof of the efficiency of the means, is the fact that not one of the 7,000 tubes have been deranged from this cause; and as to the time occupied in keeping the 14,000 joints tight, if the engineer's wages depended only upon the number of these joints which they were required to make good, their wages at the end of twelvemonths would, I fear, be *nil*.

"Scalpel," appears to estimate the power to work the cold water pumps at 15 horses power, and the quantity raised at 4,000 gallons per minute; I would ask what power he estimates the air pumps to require to raise 3,000 gallons in the same time, as they must do in the ordinary construction?

As to the "awful responsibility" incurred by the directors of the St. George's Company, by recommending an invention of which they have had several years experience, and ap-

plied to engines of the aggregate power of nearly 2,000 horses, I shall merely observe, that although they may be neither "scientific nor practical men," they are at least as commercial men, able to estimate the advantages of the invention in a pecuniary light, and may be supposed as little disposed as any class of men whatever, unnecessarily to part with "that sweet ore which every body nurses."

I cannot conclude without expressing my admiration, that "Scalpel," who is so jealous respecting the integrity of Watt's renown, should be so utterly regardless of fame for himself. The discovery that the basis of water and of the diamond are the same, which, with an excess of modesty he assigns to Newton, does not in fact belong to that great man, but to "Scalpel" himself, and I am happy in this opportunity of placing the laurel on the brow of him who has earned it, although from his sensitive bashfulness, he may blush to find it fame. I have only to request that he will inform your non-professional readers (as concisely as possibly) of the means by which he was enabled to verify the same.

I remain Sir,
Your most obedient,
TOMAHAWK.

June 10, 1840.

MR. HALL'S SYSTEM OF CONDENSATION.*

Sir,—Not having yet seen any reply to "Scalpel's" strictures on Mr. Hall's condensers, I beg to be permitted to say a few words thereon. Before I proceed to examine his argument, I feel compelled to notice the style which he has adopted, and which appears to me to be very unsuitable for one who declares himself a "Pioneer" in the march of truth. The truth in scientific matters is best elicited by calm and dispassionate investigation, but "Scalpel's" object appears to have been, (if we may judge by the tone of his letters) to produce, what he perhaps deems, a *slashing article*, under pretence of coming forward to defend that which has not been attacked. How stands the case? Mr. Hall is the author of an invention for the prevention of incrustations which take place in the boilers of marine engines, and which by common consent, and by "Scalpel's" own showing are allowed to be very great evils. Mr. Hall's invention is perfectly successful in this object, as "Scalpel" himself admits, and the amount of the evils thus obviated would render the invention a valuable one, even if obtained by some sacrifice of power, but by a test, hitherto held to be unobjectionable, it appears that instead of a loss of power, there is a considerable increase,—and several individuals whom even "Scalpel" styles "highly respectable" furnish testimonials to that effect. Now it may very well happen, that owing to peculiarities in the construction of the apparatus, this test may lead to erroneous conclusions, unless due allowance be made for these peculiarities, and if upon careful investigation, "Scalpel" concludes that such is the fact, he is not merely justified, but he is entitled to our thanks, for pointing out the error; but in so doing he is not justified in adopting the contemptuous style in which he speaks of those who may hold a different opinion to himself, nor in denouncing as a "gross delusion" an invention which he himself admits fully realises the main object for which it is intended. One who so freely charges others with "arrogance" should certainly exhibit modesty in his own person.

I now proceed to examine "Scalpel's" arguments. He appears to admit that Mr. Hall obtains by his condensers, a vacuum of 30½ inches in the lower part of the condenser, (which I may observe is the part to which the barometer is attached in all engines) but he maintains, that no such vacuum can be obtained in the cylinder, as he conceives it is against the laws of nature. Our knowledge, however, of the laws of nature, amounts only to certain deductions as to the relations between cause and effect, derived from an observation of a very limited number of facts; but, as many agencies have yet escaped notice, the code of these laws is yet very imperfect,—therefore, instead of rejecting a fact because we cannot reconcile it to our notions of the laws of nature, we should avail ourselves of the same in order to amend our exposition of these laws. In the present instance, however, I see nothing at variance with the generally received opinion on the subject.

"Scalpel" brings forward two arguments in support of his position. The first is, that Mr. Watt tried condensation both by surface and by injection, and abandoned the former mode for the latter. But this, I submit, proves nothing; the question is, not what Mr. Watt obtained by his experiment, but what Mr. Hall *obtains by his*. And I may further remark, that as steam navigation was, at the time of Watt's experiments, unknown, and as condensation by injection is not productive of evils to the same extent in land as in marine engines, he had no particular inducement to ascertain whether he could by any contrivance condense as effectually by surface as by injection. Further, as the latter mode has the advantage in simplicity of construction, he would have done right to have adopted it, even had he found the two plans equally efficient in other respects.

"Scalpel's" second argument is, if I rightly understand him, that the condenser, being composed of a great number of pipes of small diameter (3500 pipes of 2-inch bore in each condenser) which are placed between the cylinder and the air-pump, the steam is thereby throttled and cannot escape from the cylinder, except in proportion as it is drawn off by the air-pump, and that as the air-pump cannot exhaust the air of the tubes so speedily as it exhausts the undivided injection condenser, it draws principally from the lower part of the condenser, and hence the vacuum in this part will appear very perfect, whilst in the upper parts which adjoin the cylinder, the steam retains a considerable degree of elasticity.

I would observe, in reply to this, that as the area of each tube is equal to one-fifth of a square inch, and as there are 3500 tubes in each condenser, their united area amounts to 700 square inches, which will considerably exceed the area of the passages in the slide-valves. And when we consider the rapidity with which steam rushes into a vacuum (1400 feet per minute, if I recollect rightly) it becomes difficult to conceive how there can be any sensible difference of pressure in the top and the bottom of the condenser, thus connected by a passage of 700 inches area, and only nine feet long, or how there can be a vacuum of 30½ inches at the lower end of the pipes, and steam of considerable pressure at the upper.

* We beg the reader not to suppose, that it is from valuing this paper less than the preceding one on the same subject, we give it in smaller type; it is so printed, simply because we could not otherwise have found room for it in our present number, and we were unwilling to defer giving Mr. Hall's side of the question the benefit of the talent and good sense with which the present writer has treated the points under discussion. ED. M. M.

I would likewise remark that the vacuum in all engines is produced, not by the air-pump, but by the condensation of the steam, or the abstraction of its caloric, and that the only office of the air-pump is to draw off the water of injection with that produced by the condensation of the steam, and the air extracted from each by rarefaction in the condenser. Indeed, if we merely consider that the capacity of the air-pump is only one-fourth of that of the steam cylinder, and that the steam piston makes two strokes to one of the air-pump, we shall at once see how impossible it is for the air-pump either to produce a vacuum in the condenser, or to maintain it if produced by other means, and that, therefore, if the engines were left to depend on the air-pump for a vacuum, they could never start, or if started would speedily be brought to a stand-still. The vacuum, therefore, in the engines of the *British Queen* (as in all other engines), must be the effect of the condensation of the steam by the abstraction of its heat; and the fact of a vacuum of 30½ inches being actually obtained demonstrates (what might have been expected *a priori*) that steam may be condensed as rapidly by surface as by injection, provided a sufficient extent of surface and of cold water be employed. It is true that a very extensive surface may be requisite, and a larger quantity of cold water than is required in condensing by injection, but Mr. Hall has shown that it is practicable to obtain the requisite surface within the ordinary dimensions of engines; and many persons even consider that he employs more surface and more water than is necessary, inasmuch as he reduces the temperature of the water resulting from the condensation of the steam, far below that of the water in the hot well of injection engines, and that, therefore, the dimensions of his apparatus might be reduced without disadvantage.

I think "Scalpel" overrates the power required to work the cold water pumps, (force pumps he calls them, although so little force is exerted by them, that the pistons, or plungers require no packing.) He estimates the quantity of water required, at 4,000 gallons per minute, equal to 40,000 lbs., and as the effective height to which this is raised, is only equal to the height of the waste water pipe above the level of the sea, which will seldom be more than 4 feet, this is equal to 160,000 lbs. raised 1 foot high, or about 5-horses power; and if we allow as much more for the obstruction caused by the pipes, we shall still have only 10 horses instead of 30, which "Scalpel" appears to think is required. On the other hand, let us examine what force would be required to raise 3,000 gallons per minute by the air pump, which quantity he says, would be requisite if the engines condensed by injection. In this case it must be borne in mind, that there is no counterbalancing pressure on the under side of the bucket of the air pump, as there is below the piston of the force pumps, but there is a vacuum on the under side of the bucket, and the pressure of a column of water on the upper side, equal in height to the distance from the top of the bucket to the waste-water pipe, which, as a mean cannot be less than 10 feet. We have therefore 3,000 gallons, or 30,000 lbs. raised 10 feet high = 300,000 lbs. raised 1 foot high, or about 9-horses power. So that the difference, even with the liberal allowance which I have made against Mr. Hall's apparatus is not worth notice.

As to the objections which "Scalpel" makes on the score of complexity, that is no valid objection, if the object in view can be obtained by no other means. No one objects to a chronometer because it is more complex than a wooden clock. I admit, that these engines are more complex in their *construction*, but I contend at the same time, that they are, by that very circumstance, rendered more simple in their action, and that they do in consequence impose less work on the engineers than injection engines. These latter require constant attention to the injection, and to the feed, and a blowing off of the boilers, at least once in four hours, whilst Mr. Hall's, on the other hand, require only to set the distilling apparatus in action once or twice a day, and this is effected by simply turning two cocks.

I cannot speak positively as to the question of expense, but I have reason to believe that "Scalpel" is, (to say the least) *in error*, on this point, and at all events, there is a set off in the increased durability of the boilers, and the diminished consumption of fuel, which are the evils "Scalpel" attributes to condensation by injection, and which he admits are completely obviated in Mr. Hall's invention. Against the increased weight occasioned by the apparatus, and which it is not to be supposed that "Scalpel" underrates, we may place the smaller weight of fuel required, and there will then, I apprehend, be little left to complain of on this head.

Apologizing for trespassing so far on your patience,

I remain, Sir, yours obediently,

ANOTHER "PIONEER ON THE MARCH OF TRUTH."

NOTES AND NOTICES.

M. Daguerre's Latest Improvement.—The powers of the Daguerrotype have hitherto been limited to the representation of "still life." Any attempt to pourtray objects in a state of motion, has always been a failure. If the object was moving with much rapidity, no trace was left upon the picture; if the motion was slower a slurred and blotted appearance was presented, arising from an imperfect representation of the moving body being spread over the path travelled. M. Daguerre recently informed Sir John Robison that he had nearly completed an improved process, by which the Daguerrotype will be capable of receiving instantaneously the impression of any objects presented to it. Invested with this splendid power, the instrument will become altogether unrivalled; it will only have to be presented to the stage of a theatre, the bustling street of a city, &c., when an accurate picture of things as they are in motion at the precise moment, will be obtained. With equal facility we may thus procure faithful portraitures of the most striking dramatic representation—all the pomp and circumstance of war as developed in mimicry at reviews—the vehement debates in the senate house—the marriage of a Queen—or the rejoicing of her subjects—all which may thus be represented with a fidelity and force of which the pencils of the most skilful artist can never become susceptible. W. B.

Fire Escapes.—The following motion is to be brought forward by Mr. Lott at the next Court of Common Council:—"That a premium be offered by this corporation for the best model or design for a fire-escape; that it be referred to the committee for general purposes to fix the amount of such premium, to select a competent number of scientific persons to award the same, and to direct the construction of an adequate number of such machines; and that one of them be placed in an accessible position and constantly ready for immediate use at each of the police and fire-engine stations of this city."

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No. 881.] SATURDAY, JUNE 27, 1840. [Price 3d.

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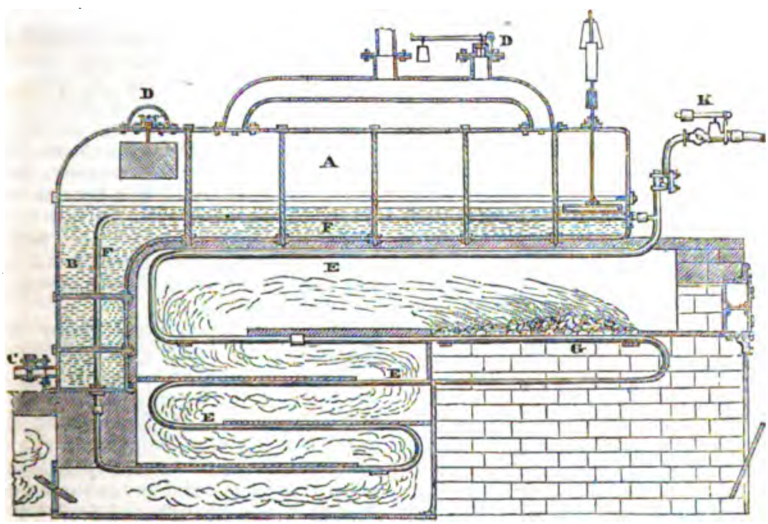
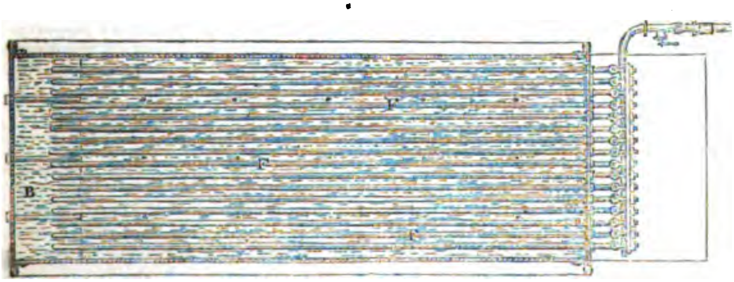
MR. A. M. PERKINS'S PATENT STEAM BOILER.





MR. A. M. PERKINS'S PATENT STEAM BOILER.

[Patent dated 16th Dec. 1839; Specification inrolled June, 1840.]

The general principle on which this new steam generator is constructed, is that the part commonly called the boiler shall not be exposed to the direct action of fire, but be heated through the medium of a number of small pipes filled with hot water under pressure, much after the manner of the well known house warming apparatus of the same patentee. It is considered to be fully proved by certain experiments to be presently noticed (though for ourselves we have our doubts) that the pipes, to which only the direct heat of the fire is applied, will absorb and transfer the heat of the fire to the water in the boiler, with greater velocity, than the same quantity of heat can be transmitted through the same extent of metallic surface, as in ordinary boilers; and the principal consequent advantages claimed for this new arrangement are, the capacity of producing a greater quantity of steam within a given time, greater safety, and greater durability in the parts exposed to the violent action of the fire—for, the hot water pipes being always full charged, without any evaporation taking place of the water within them, it is supposed that no deposit can ever take place to cause any waste of their substance, or to impair their heat absorbing and transmitting properties.

In order to test the value of this invention, Mr. Perkins caused a boiler, such as is represented in the engravings prefixed to this notice, to be erected and kept in constant work for nine months; and it is stated to have answered to his entire satisfaction. With the view, however, of "placing the peculiar merits of his boiler beyond doubt, Mr. Perkins applied to Mr. Parkes, Civil Engineer, whose experience and writings pointed him out as eminently qualified to determine a question of this nature, and whose opinion on the practical working and qualities of the boiler, if satisfactory, Mr. Perkins considered would entitle it to the confidence of engineers and the public." Mr. Parkes accordingly undertook to institute a series of experiments on the subject, and has made a "Report," which has been printed* and is now before us, in which he assigns to Mr. Perkins's boiler a superiority over all other boilers ever constructed.

In the sectional elevation and plan of the boiler with which these experiments were made, given on our front page, A, represents the boiler (properly so termed); B, a pocket or water box; C, the discharge cock; D, D, safety valves; E, E, the hot water pipes, subjected to the direct action of the fire; F, F, the same pipes in what may be called their transferring state or position; G, the grate; and K, the expansion valve.

A force pump for supplying the hot water pipes, and a pressure indicator are also added to the apparatus, but omitted in the engravings for want of room.

The cubical contents of the boiler part (A,) are 52.25 feet; allowing 20.000 for the water, and 32.25 for the steam. The hot-water pipes are 16 in number, their total length 772 feet. The bore is half an inch; the outer diameter one inch. Each pipe contains only about half a gallon of water, and the whole 16 not more than eight gallons diffused throughout the 772 feet.

The experiments made under Mr. Parkes's superintendance were nine in number; the proof pressure was 100 lbs. per square inch; extreme working pressure 41 lbs. Mr. P. has reduced the whole of the results obtained into a Table of a form similar to that appended to his paper on boilers, published in the Transactions of the Institution of Civil Engineers, Vol. III. Part I. We have not room for the Table itself, but shall extract some of the more remarkable passages of Mr. Parkes's explanatory Report; before doing which, however, we must express our regret to see in a paper, which should have been one of positive facts, and calm deductions only, such frequent inexactness of language—so much loose statement and looser speculation—and such a palpable effort throughout to make *the utmost possible* of the case in hand—a case which, if there be no material error in the reported results needed no such injudicious advocacy. Some passages which we have marked by *Italics*, with the notes subjoined, will show what we mean.

Transmitting power of the hot water pipes.—"The rapidity of the circulation, or perhaps it would be better expressed, the

* *Published* also, we presume, by Mr. Weale, whose name is on the imprint of the copy sent to us.

velocity *of the current of heated water*,* in the pipes *must be very great*, as in each of the sixteen sets there is only half a gallon of water; and this slender thread of water, half an inch in diameter, traverses forty-eight lineal feet in its process of absorbing and imparting caloric. It appears to me that each particle of water *must either be in a state of inconceivably rapid motion*, or that its power of conduction, when under pressure, *must be* far greater than that of water in its natural state, or, indeed, than any vehicle of caloric with which we are acquainted. If the water be not in motion, the heat imbibed by it *must be* transmitted from particle to particle *with electric velocity*; but we know the conduction of heat by water to be effected by change of place amongst its particles, which is motion.

"The rapidity of this motion within the pipes of your boiler is practically exemplified by the production of steam in the recipient, for no appreciable time *seems to be* occupied in the transfer of caloric; a sudden increase or diminution effected in the temperature of the furnace, *seems to be* propagated to the water in the recipient as quickly as if the recipient itself were exposed to the fire. I am *the more particular* in stating *this fact*, as upon it depend several matters of consequence in practice. The inspection of a drawing or model would have induced me to think that the production of steam could neither be accelerated nor checked so quickly in this as in common boilers; but I am able, from the conduct of the experiments, to assert that in these important practical respects, there is no difference between them. The fire and generation of steam are under the same control by the damper in your boiler as in those of the ordinary construction.

"In the absorption and transfer of heat by the pipes of the boiler experimented upon, another remarkable phenomenon presented itself, viz., that forty-four square feet of pipe imparted to the water in the recipient, *the whole* of the heat taken up by 117 square feet exposed to the fire; and, as it was ascertained that the heat entered the chimney at a higher temperature than that of the steam, we know the absorbing surface to have been in every part of it, hotter than the water in the recipient. This proves water to be a much better conductor of heat than iron, for an equal surface of water has abstracted from the iron pipes $2\frac{6}{10}$ times *more heat than the pipes have absorbed from the fire in the same interval of time*.† It seems, indeed, probable, from some experiments which you communicated to me, and which induced you to assign these proportions of absorbing and transferring surfaces, that an equal effect would be produced with a somewhat less proportion of the latter surface."

Power of the boiler.—"The power of your boiler, compared with others, is best shown by the results in column 20 of the Table. The mean of experiments IV., V., VI., and VII., performed at a rate of combustion which may be called the most common rate of condensing engine practice, exhibits a product of 11 cubic feet of water converted into steam per hour from 117 square feet, equal to 1 cubic foot from 10 square feet of surface exposed to heat, and 100°, the initial temperature of the water, is about the average of that of the hot wells of condensing engines, whence the boilers are fed."

Safety and Durability of the Apparatus.—"These important qualities *appear to me* to be attained by your apparatus in a degree *far superior* to those possessed by any other description of boiler which ever came under my notice.

"Deterioration and insecurity occur in steam boilers from various causes, but, it may be said, principally from selenitious deposits on the parts exposed to heat; from the corrosive action of the fire, or its deposits on the exterior of the metal; and from deficiency of water.

"By your arrangement the small pipes alone are attacked by the fire, and the water within them not being evaporated, there *can be* nothing deposited by the water to impair their substance or their action as carriers of heat. So long as these pipes remain full, *it strikes me that they must be almost indestructible.* Supposing, however, the metal in course of time to become impaired, *from some cause with which we are unacquainted*,* all that can occur is, that a pipe may burst and discharge its water; or, *let supposition be pushed to the extreme, and let all the pipes be imagined to burst at the same instant*, the effect will be the issue of a few gallons of water in a state of steam, which is harmless. And should the pipes, *in consequence of such bursting*, become red-hot; no personal mischief can arise, for there *exists nothing in an empty pipe*, however hot, to produce mischief.

* Mr. P. means the velocity of the heat, there being *no current of water*.—Ed. M. M.

† As the water in the pipes can only get their heat through the surrounding metal of the pipes, it is clearly impossible that it can *abstract* from the pipes *more* than they *absorb*.—Ed. M. M.

* Why, Mr. Parkes has himself told us only a few lines before that "deterioration may arise from the corrosive action of the fire or its deposits on *the exterior* of the metal."—Ed. M. M.

"With respect to the second cause of deterioration in common boilers, we know that soot and tar are condensed upon the surface of ordinary boilers by the abstraction of heat from the products of combustion; we know the diminished conducting power of metallic surfaces thus coated, and also the corrosive action of these deposits. Your pipes *do not appear* to attach any soot or tar to them, *and the reason obviously is*, that the water within them is too hot to condense these products. If there were any such coating upon them *it would appear* at the point of issue from the pocket where the pipes are the coolest; but, whilst burning coals, I could not perceive any such coating, though I frequently examined the pipes at the flue opening.

"No deterioration from these causes *can possibly* affect the body of the boiler or recipient, it being altogether insulated from the fire and from the products of combustion; that vessel, therefore, *cannot* suffer decay of its exterior *except from leakage.* Thus, I conceive this second great source of expense, and one cause of danger, to be obviated in your boiler.

"The third cause of deterioration, and frequently of imminent danger, whether produced by neglect or accident, viz., deficiency of water, is proved by direct experiments to have no existence in your boiler. Feeling, as I did, the most perfect confidence in the safety of the apparatus, I submitted it to the following *fierce and conclusive* tests."

Who looked after the Pipes during the "fierce and conclusive tests."—"During both these experiments *the heated pipes took care of themselves*, discharging a portion of their water through the valve provided for that purpose, as its dilatation and pressure increased."

Freedom from Priming.—"The following conclusions flow from these last experiments:—1st. That your boiler may be blown off, and entirely emptied, *without the slightest danger or inconvenience*, when the fire is in full activity, and that in a few minutes an engine may be again at work. In *practice* it would be *always wise* to keep the fire-door open during the evacuation and refilling of the boiler.

"2nd. That in the event of an engine-man neglecting to supply the boiler with water, or in the event of any derangement occuring to the feed apparatus, no harm *can* ensue; for both the quantity of steam produced, and its pressure, rapidly diminish when the water quits the pipes. An engine would stop for want of steam, and announce the fact of your boiler becoming dry, were it otherwise unobserved.

"3rd. That no harm *can* ensue from suddenly injecting cold water into your boiler when empty, and an intense fire in action, as the heated pipes would discharge their water before it could attain a temperature capable of decomposing steam in the recipient.

"4th. That a vacuum *cannot* be produced within the boiler by the sudden injection of cold water by the ordinary feed pumps when the fire is in action; for, as the supply is sent through the pocket, the pipes evaporate fast enough to maintain a constant elasticity of steam above atmospheric pressure.

"5th. That all the expense and danger consequent to overheated, or dry flues, in marine or other common boilers, are avoided by your arrangement; for, in your boiler, there are no flues nor extensive weak surfaces to be burnt, burst, or collapsed."

The Grate and its separate adaptation to ordinary boilers.—"It remains that I should report to you the result of my observations on the properties of your grate, which forms an important part of the invention.

"The grate is in fact a portion of the heating apparatus, and absorbs caloric from the fire equally with every other part of the pipes. It is so much heat-absorbing surface added to the boiler. But it performs another valuable office; the pipes abstract the heat so rapidly from the fire, that the fused metallic or earthy portions of the combustible do not adhere to them. Consequently the scoriæ or *clinker*, as this refuse is commonly called, does not close the air spaces, and the poker is unnecessary for raising it up. Coke is known, from the greater intensity of its heat than coal, to be troublesome as a fuel for boilers, on account of its clinker adhering firmly to the fire bars. No such effect takes place on your grate; each piece of clinker remains as free upon the grate as a piece of cinder, or ash. The cause of this is very obvious. Solid iron grate bars frequently become fused on their upper surface, and unite with the scoriæ of the fire; or the slag, in a state of fusion, runs between the bars. Hence their rapid destruction with intense fires, and hence the labour of clearing them. The solid bar has not sufficient conducting power *to cool down the slag without itself being burnt.* The circulation within your pipes converts them into such good conductors that the slag seems to be solidified before it reaches them. It appears generally to rest upon the ashes, and the ashes on the bars, for I observed ashes and pieces of cinders adhering to the clinker; but I have in no instance perceived an impression of the pipe on its under surface; nor, during the experiments, was there any occasion to use the poker or the pricker to facilitate the en-

trance of air to the fire. Thus, whatever falls into the ash-pit may be again thrown on the fire, till all the combustible matter of the fuel is consumed, which was my practice at the termination of each experiment.

"These are practical proofs of the quality of your grate in neutralizing the inconvenience and expense arising from clinkering fuel; but the conducting power of these pipes full of water in circulation, is perhaps still better illustrated by pouring red-hot lead upon them. The lead is instantaneously solidified; whereas, if it be poured upon an empty pipe, or a pipe filled with cold water, in which there is no circulation, the lead remains fluid for some time. The experiment requires that a small bath of clay be formed about the pipe to hold a cup full of molten lead. The rapid absorption of heat by your boiler apparatus is thus very elegantly exemplified.

"In this boiler the grate formed part and parcel of the apparatus; but it may be applied separately to boilers in common use with the same advantages as respects the non-adherence of clinker, and durability, with the addition of a certain quantity of evaporative surface."

TAYLOR'S ELECTRO-MAGNETIC ENGINE.

Sir,—As I receive your Magazine monthly, it is only now that I have seen, in the number for 9th May, an engraving and description of Mr. Taylor's electro-magnetic engine, together with an account of that mode of applying the magnetic action to the working of machinery, to which Mr. Taylor lays exclusive claim. Now, as I imagine, that I too have a claim to this mode of application, I beg to be allowed to offer a few remarks in vindication of that claim.

I am aware that in coming forward as I now do, to contest the right of an individual to the exclusive possession of an invention for which he has obtained a patent, I place myself in a somewhat suspicious position; and, however well satisfied I might be of the justice of my claim, were it not that the evidence I shall be able to offer in support of it, is such as I think cannot be withstood, I should willingly shun the risk of incurring the imputation, which attempts such as that which I now make, not unfrequently deserve. As matters stand, I cannot see but that I am perfectly justified in seeking to vindicate my right.

So far as I am aware, the first intimation given to the world of Mr. Taylor's invention, was in the list of patents published in the number of your Magazine for the 30th of November last, at page 158 of your present volume.

Now I conceive, that if I can show that the application of the magnetic action to which Mr. Taylor, in his specification lays exclusive claim, was known to, and practised by me years before Mr. Taylor's patent was heard of, I shall have established my claim to originality at least, if not to priority of invention. And if I am further able to show that I have made no secret of my operations, but have all along willingly exhibited and explained all that I had accomplished to every one that wished it, I know enough of the patent laws to be aware, that neither Mr. Taylor, nor any else, though fortified by fifty patents, can prevent me from following out my researches, and applying their results to any purpose I choose. To these two points therefore, I now address myself.

On the 7th of October last, the Rev. Dr. Forbes, Professor of Chemistry and Humanity in the University and King's College, Aberdeen, did me the honour to address a letter to Dr. Faraday in reference to a series of experiments and researches on Galvanism and Electro-magnetism, in which I was then, and had been for several years previously engaged. In this letter Dr. Forbes, with my concurrence, described the progress I had then made, and detailed several new results at which I had arrived. This letter, as intended by Dr. Forbes and myself, was communicated by Dr. Faraday to the Editors of the *London and Edinburgh Philosophical Magazine*, and it appeared in the No. of that Journal for November last, at page 350.

Dr. Forbes's letter then, was written upwards of three weeks, and printed and published some days, before the date of Mr. Taylor's patent, no public intimation of that patent, moreover, having been given, so far as I am aware, till four weeks after the patent was dated. The testimony of this letter, therefore, in reference to the positions I have undertaken to prove must, as I apprehend, be altogether unexceptionable.

I first present in columnar contrast the extract from Mr. Taylor's specification which you have given, in reference to his claim of an exclusive right to a

particular application of the magnetic action, along with an extract from Dr. Forbes's letter, bearing on the same subject.

Mr. Taylor's Specification.

[Patent dated Nov. 2, 1839; Specification sealed May 2, 1840.]

Mechanics' Magazine, vol. xxxii, p. 694.

"Mr. Taylor employs as his prime movers, a series of electro-magnets, which are alternately and (almost) instantaneously *magnetised and* DEMAGNETISED WITHOUT ANY CHANGE OF POLARITY WHATEVER TAKING PLACE, and in bringing certain other masses of iron or electro-magnets successively under the influence of the said prime movers when in a magnetised state, and in DEMAGNETISING THE SAID PRIME MOVERS as soon (or nearly so) and as often as their attractive power ceases to operate with advantage; or in other and perhaps plainer words, *his invention* CONSISTS in LETTING ON OR CUTTING OFF a stream of the electric fluid, in such alternate quick and regular succession, to and from a series of electro-magnets, that they act always attractively or positively only, or with such a preponderance of positive attraction, as to exercise an uniform moving force upon any number of masses of iron or magnets, placed so as to be conveniently acted upon."

Dr. Forbes's Letter.

[Dated October 7, 1839; Published Nov. 1, 1839.]

London and Edinburgh Philosophical Magazine, vol. xv, page 350.

"Mr. Davidson has been busily employed for the last two years in his attempts to perfect his machines, during all which time I have been acquainted with his progress, and can bear testimony to the great ingenuity he has shown in overcoming the numberless difficulties he has had to encounter. So far as I know, he was the first who *employed the electro-magnetic power in producing motion by simply* SUSPENDING THE MAGNETISM WITHOUT A CHANGE OF THE POLES. *This he accomplished about two years ago.*"

Now, I appeal with the utmost confidence, to any man possessing even the most superficial knowledge of the science of electro-magnetism, whether there is the slightest distinction between my invention, "accomplished," as Dr. Forbes declares, "about two years" previous to the 7th October, 1839, and that to which Mr. Taylor lays claim in his specification, dated May 2, 1840. They are so clearly one and the same invention, that I apprehend nothing farther need be said to establish their identity.

With regard to the several points, namely, the fact of publication, it will be perhaps sufficient to refer to the circumstance of Dr. Forbes's letter (which contains, as we have just seen, a description of my invention,) having been published as already stated, with my concurrence and approbation. But on this point likewise, that letter is so explicit, that I must crave your indulgence while I quote from it again a single sentence. Dr. Forbes says, page 351.

"For it deserves to be mentioned, that he (Mr. Davidson,) *has made no secret of his operation, but has shown and explained all that he has done to every one who wished it.*"

If further evidence on this point were needed, I can name, in addition to Dr. Forbes and Dr. Fleming (the latter Professor of Natural Philosophy in the University and King's College, Aberdeen,) and many other inhabitants of this city, the following gentlemen, all of whom saw, and examined, my machines long before either Mr. Taylor, or his patent was heard of: viz., Rev. Dr. Forsyth, of Belhelvie, inventor of the percussion lock; Capt. Gordon, Royal Engineers, Woolwich; the Right. Hon. Lord Hatherton; Lord James Hay; John Davidson, Esq., C. E.; John Thorburn, Esq., of Murtle, &c.

Having thus established the positions with which I set out, namely, the originality, and so far as appears the priority of my invention, and also the fact of its publication by me previous to the granting of Mr. Taylor's patent, I repeat the determination I have already announced, namely, that I shall continue my researches, and apply their results to any purpose I choose, just as if no such person or patent were in existence. I have no quarrel with Mr. Tay-

lor, nor do I bear him any ill-will; on the contrary, I hail with satisfaction the appearance of so efficient a fellow-labourer as Mr. Taylor has proved himself to be, in a favourite field of science. Nevertheless, I cannot consent to be deprived of the use of an invention I have made, and which, without fee or reward, I have freely communicated for the public benefit. And therefore I take this public manner of intimating to Mr. Taylor the course I intend to pursue in reference to my invention.

In Dr. Forbes's letter, to which allusion has so frequently been made, it is stated that at the time it was written I had two arrangements for the production of motion by magnetic action in operation, and a third in progress. The third I have since abandoned, but of the first, which I think is rather superior to the second, I may perhaps by-and-bye, as my time will allow, send you a description for insertion in your Magazine. Of my second arrangement I would say that perhaps a more extraordinary resemblance than exists between it and Mr. Taylor's machine, as described and figured in your Magazine —a resemblance extending even to the minutest details—never existed between the realization of the ideas of two independent inventors. I say independent inventors, for I should be sorry if it were thought that I meant to insinuate, what I do not myself believe, that Mr. Taylor borrowed either his principle from me, or the idea of his machine from mine. Nevertheless, so close, as I have said, is the resemblance between his machine and one of mine, that independently of the framework, I believe the chief differences are, first, that the circumference of Mr. Taylor's revolving desk is composed of alternate parts of copper and ivory, while the circumference of mine is composed of alternate parts of copper and boxwood; and second, that in Mr. T.'s machine the armatures appear to be sunk to about half their depth in the periphery of the wheel to which they are attached, while in mine they are sunk their whole depth, so as to be *flush* with the cylindrical surface. On this last point Mr. Taylor is evidently in error, for the air must present considerable resistance to the rapid revolution of his wheel with the armatures so placed. Mr. T. would almost appear to have been misled by an idea, which I can hardly imagine he entertains, viz. that the interposition of the wood between the magnet and the armature would interrupt their mutual action. Were this idea correct the figment of a perpetual motion would no longer have to be sought.

Were it not, Mr. Editor, that I have already occupied so much of your valuable space, I should make bold to request your insertion of the whole of Dr. Forbes's letter, as it indicates some other improvements of mine in electro-magnetism, which improvements I may afterwards more fully describe in your pages, I am, Mr. Editor,

Your most obedient servant,

ROBERT DAVIDSON.

Canal Road, Aberdeen,
June 15, 1840.

[We shall give in our next the whole of the letter of Dr. Forbes referred to by Mr. Davidson; but may here take the opportunity of stating a fact which will be allowed to have a most important bearing on the question of priority of discovery involved in this case, namely, that Captain Taylor's American patent for the same invention, which he has since patented in England, is dated as far back as 1838. We may add, too, that though there were nothing more in the case than appears on the face of Mr. Davidson's communication, Captain Taylor's patent would, in point of law, be valid enough nevertheless; for as the Court of Common Pleas decided in the recent case of Galloway *v.* Bleaden, it is no ground for annulling a patent for an invention that there may have been previously "many experiments made in the same line and almost tending, if not entirely, to the same results," as long as nobody before the patentee has advanced the length of making it "publicly known and used in England." Having volunteered so much on one side of the question we may be excused for adding, that whatever may be the historical or legal rights of Mr. Davidson, no one can fail to admire the candid, temperate, and truthful spirit in which they are asserted.—ED. M. M.]

MR. ADCOCK'S NEW METHOD OF RAISING WATER.

Sir,—At the last quarterly meeting of the Manchester Geological Society, Mr.

Adcock, C.E., read a most interesting paper on his patented invention for the raising of water from mines, and illustrated his subject by numerous diagrams, which excited much attention.

This invention is wholly unlike every thing that has preceded it; and should it answer as well in practice as in the experiments already made, it must be regarded as one of the most important inventions of the day.

It can be put down, even in the deepest pits, at comparatively little cost; for there are *no pumps, no clacks, no valves, not even a pump-rod* but simply one pipe extending to the bottom of the mine, and another pipe united to it, extending from the bottom to the top.

These pipes are made of thin sheets of zinc or copper—wear and tear, comparatively speaking, nothing.

We will, however, let Mr. Adcock describe his invention nearly in his own words.

He stated that, encouraged by some former attempts to improve pump-work, by which he had been enabled to make one valve do the work of four clacks, he was emboldened to attempt still further improvements, and eventually proposed to himself this question: Is it possible, in the raising of water from mines, to do without clacks or valves altogether? He knew this could not be done if the water were to be raised in a compact form, as in pump-work. For, in a pit 1,000 feet deep, the column of water being also 1,000 feet, the pressure against the sides of the pipe, towards the bottom, would be 440 pounds to the square inch, which no ordinary pipe could resist. Mr. Adcock next considered whether it might not be possible to bring up the water in a finely divided state, and he found that if the water were so brought up, it must be in the state of vapour or of rain. This chain of reasoning led him to investigate the descending velocities of drops of rain, when he found that by the laws of gravitation they ought to descend with a constantly accelerating speed; so that if the cloud were high from which they proceeded, they would fall so violently as to inflict injuries of a serious nature upon animal and vegetable life. This, however, was prevented by the resistance of the air. Each drop of rain, while in the cloud, may be considered as in a state of quiescence. It begins to descend from a state of rest, with a motion constantly accelerating, and so continues until it acquires a certain amount of speed, from which time the rate of its descent is uniform. Mr. Adcock then proceeded to investigate the greatest descending velocities of drops of rain, and he found that, under ordinary circumstances they do not exceed from 8 to 12 feet in a second. From this it seemed to follow, that if water in globules of a certain size and weight, like drops of rain, cannot, under ordinary circumstances, descend with a greater speed than 12 feet a second. It is certain, that if these drops were kept in a quiescent state, and a current of air were made to move upwards, at a greater speed than 12 feet a second, they would flow upwards instead of downwards, no matter what the height might be, And this Mr. Adcock has found by actual experiment, to be the fact.

Mr. Adcock, therefore, does not raise water in a solid mass, as in a pump, but in a divided state, like rain. In fact it is nothing more nor less than a machine for raining upwards! His apparatus consists of a fan like a common blowing machine, which has given to it the required velocity, from any suitable prime mover. Also two pipes, as before stated; one to convey the air from the fan to the bottom of the mine, and the other to bring the air back to the surface, together with the water that accompanies it. With a 20 inch fan, 6 inches wide, he has driven up 63 gallons of water per minute, to a height of 40 feet, and with a 3-feet fan, 1 foot wide, erected at the works of Messrs. Milne and Co., at Shaw, near this town, he has driven up 130 gallons of water per minute, 120 feet in height.

Mr. Adcock's experiments having been witnessed by a large body of experienced and scientific men, they have subscribed a certain sum each, that this important discovery should be at once fully tested; and the necessary machinery will speedily be put down at the Pemberton Colliery, near Wigan. The depth of the pit is 100 yards, and from that depth it is expected that they will be able to raise 300 gallons of water per minute. The fan will be 6 feet in diameter, and 18 inches wide.

I shall anxiously watch the progress of this invention, and will not fail to forward any information worth puttin

to paper, regarding this novel method of draining.

It is always to me extremely gratifying to find scientific men who have been working as it were in opposite directions, arriving at the same conclusions.

Mr. Adcock remarks that, after the drops of rain in their descent acquire a certain velocity, their motion is uniform. Now this exactly coincides with Dr. Lardner's opinion with regard to the descent of railway carriages upon steep inclines. On several inclined planes he found that whether the carriage descended from a state of rest, or was projected over the summit level at 40 miles per hour, by an engine in the rear, the train invariably reached the bottom of the incline at the same velocity. Joining these two ideas together, it has suggested to my mind a very easy method of measuring the velocity of a current of air or any other fluid.

Let the pipe conveying the air, &c. have a semicircular bend, and let a small heavy ball be put into it; this ball will ascend and descend in the curve in exact accordance with the velocity of the current. I am,

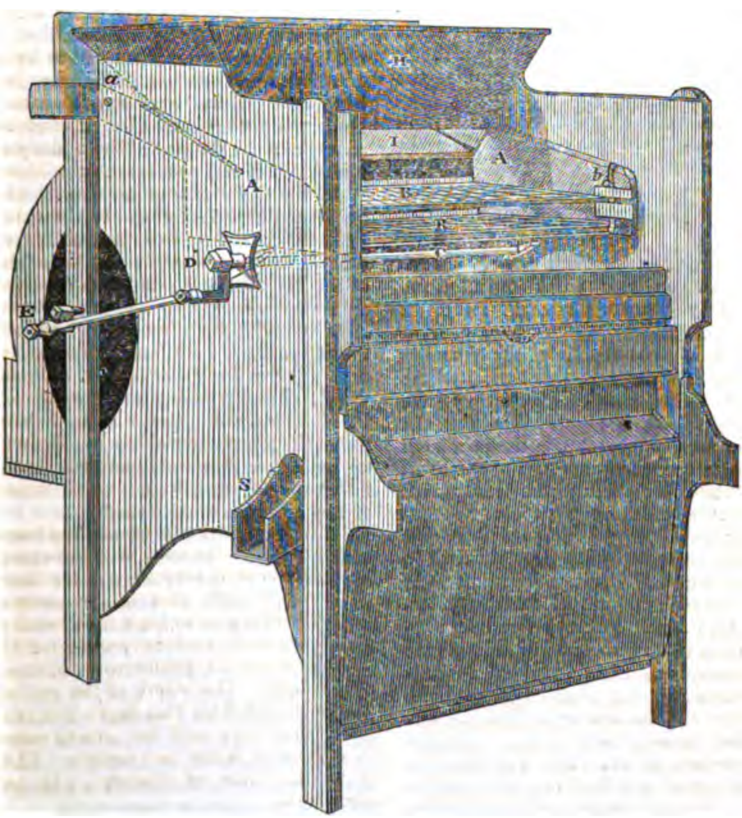
Yours most respectfully,

WM. JONES.

Manchester, June 16, 1840.

DRY'S IMPROVED CORN DRESSING MACHINE.

[Registered pursuant to Act of Parliament, 8th June, 1840.]



The parts in this improved machine, which Mr. Dry, the registered proprietor, claims as new, are those marked A B C and D, which constitute, in combination with E, what is called *the shaker*.

A A are iron cheeks, secured to the

sides of the machine by pins *a a*, on which they rise and drop freely.

B B are sifting frames which fit into ledges in the cheeks A A, and are secured there whilst in use by the pins *b b*. By taking out the pins *b b* these frames may be removed, and others of larger or smaller meshes substituted for them, according to the description of grain required to be dressed.

C is a tilter with two upright teeth, one at each end, which act against the bottoms of the iron cheeks A A, to make them rise and fall.

D is a crank affixed on the outside of the machine to one end of the tilter C, and connected by a rod with another crank F, attached to the end of the shaft of the blower of the machine; so that for every entire revolution which the blower makes, the teeth of the tilters describe an arc of a circle, and thus give a continuous up and down motion to the cheeks A A, and the frames resting upon them.

H is the hopper, which supplies the grain to be sifted.

I is an inclined shelf, secured within the two cheeks, which conducts the grain to the sifters B B.

S, one of the shoots through which the grain passes after being dressed.

FIRE-ESCAPES IN THE CITY. — PROPOSAL TO INCREASE THE EFFICIENCY OF THE POLICE IN CASE OF FIRES.

Sir,—In consequence of the alarming prevalence of fires at this time, and the fatal consequences by which they have been attended, it is probable that the public apathy may at length be stirred up, to a consciousness of the extent of the existing danger, and the facility with which it may be remedied.

It is stated in your last number, that the matter is to be brought forward in the Common Council, a committee of scientific men appointed, a reward offered for the *best fire-escape*, and an adequate number of the approved machine (whatever it may be) stationed in convenient accessible places. Should the intentions of the mover of this proposition be honestly carried out, immense benefits will result. The question has arisen out of the late dreadful loss of life at a fire in Ivy Lane, Newgate-street. Just ten days before this catastrophe, I had addressed a communication to D. W. Harvey, Esq., chief commissioner of the City Police, calling his attention to the necessity of rendering that force more efficient for the protection of life, and the preservation of property, in case of fire. To accomplish this highly desirable object, I suggested the adoption of the *Portable Fire-escape Ladders*—in connection with the *Antiphlogistic-vessels* of the ingenious Capt. Manby. Both these inventions have been very fully described in your early volumes, and the combination of the two (with proper instructions) in charge of the police, are calculated greatly to limit, if not entirely prevent, the recurrence of disastrous and fatal fires. This communication was dated May 29; on the 17th of June, I was favoured with an acknowledgment of its receipt, and informed by D. W. Harvey, Esq., that "*my suggestions were not likely to be entertained by the city authorities!*"

From this it may be inferred, that the old corporation leaven has still to be encountered and discomfited before any kind of "reform" or improvement can be introduced; even though that improvement be demanded by a daily sacrifice of life and property!

At the Coroner's inquest on the five unfortunate sufferers in Ivy-lane, the keepers of the parish fire-ladders endeavoured to excuse their non-attendance at the late fire, by stating that these ladders were so cumbersome, that it would have taken above a quarter of an hour to get them out! In answer to a question put by the coroner, Mr. J. Braidwood, superintendent of the London Fire Establishment, gave it as his opinion, "that the present parish fire-ladders were exceedingly cumbersome and wholly unfit for the purpose!"

The question resolves itself into two points, viz.: the best kind of fire-escape, and the proper persons to have charge of them. On the latter head I fancy there can hardly be any difference of opinion. To maintain a body of men as numerous as the night police, for the express purpose of attending fires, would in a pecuniary point of view, be entirely out of the question; besides which, this office seems so naturally part and parcel of their routine duties, that it would be absurd not to fit them with all the requisites for making them perfectly efficient.

With respect to the most eligible fire-

escape for their use, whatever difference of opinion may at present exist, the question, if taken up *impartially* by *practical* men, is one that I am sure can very speedily be settled, and the superiority of some particular plan incontrovertibly shown.

Independently of the importance of the subject, it is one about which there has been great dispute, and the settlement of this question satisfactorily, may perhaps lead to a better state of things as regards the metropolis generally—the unprotected state of which, as regards escape from fire, may be in some measure attributed to the *charlatanism* which has been too largely mixed up with these matters.

I remain, Sir,

Yours respectfully.

W. BADDELEY.

London, June 20, 1840.

SURFACE AND INJECTION CONDENSATION—NECESSITY OF EXPERIMENTAL EVIDENCE TO DETERMINE THEIR COMPARATIVE MERITS.

Sir,—It is probable that a considerable portion of the *Mechanics' Magazine* might be occupied without avail by the discussion of the respective merits of condensation by injection and surface, while a few experiments fairly made would tend to throw far more light on the subject. In either case, perhaps, too much attention has been paid to the perfection of the vacuum, and the last inch or two is occasionally, I suspect, gained by an expenditure of power, more than equivalent to the advantage of improvement.

The value of time in condensation seems only regarded in one district, where the exhausting or eduction valve is opened a half or a quarter of a second before the steam valve, a method easily managed in single acting pumping engines, the number of whose strokes per minute is regulated by a cataract, and it is equally practicable to a certain extent in rotative engines with separate valves or slides similar to those patented by the Messrs. Seaward.

As the temperature of the last portion of the steam to be condensed approaches towards that of the injection water, condensation doubtless becomes slower, and perhaps a considerable part of the stroke is often made before the last inch or two of the vacuum is produced by the cylinder. The proper question is, not which engine has the best vacuum, but which engine can produce the greatest neat or surplus power for an equal steam expenditure?

One of your correspondents has done good service to the cause of truth by an explanation of the position of the barometer in Hall's condensers, by means of which a 30 inch vacuum is exhibited.

A series of observations with two barometers, one in its present situation near to the air-pump, the other close to the eduction valves, would form an interesting experiment, of importance to steam navigation; but I must protest against the attempt of another correspondent to decide the question of relative merit by a reference to Watt's opinion in 1776. It might have been of value as an argument to deter persons desirous of attempting condensation by surface, yet it is no test of the result asserted to have been obtained by parties who have had spirit enough to undertake condensation by surface in defiance of that opinion.

Machinery was executed in a very inferior manner to the present time in 1776, when Watt abandoned contact condensation according to the quotation from his letter to Smeaton, and Hall's success in 1840 is perfectly compatible with Watt's failure in 1776.

Moreover, the argument applies to different conditions. Watt referred to fresh water injection alone, but it would be absurd to speculate on the exertion that might have been made by him, had he had salt water difficulties to contend with.

Again, Hall has expressly provided a remedy to remove the incrustation from bad water, which is the very cause adduced by Watt as the reason for abandoning condensation by surface. Fourteen miles of half inch pipes, and 14,000 joints, though an appalling contrivance even at present, would have been much more so in 1776. No record remains of the extent of surface employed by Watt. In one of Hall's statements it was asserted that 2,800 square inches of surface would condense 60,000 cubic inches of atmospheric steam. I prefer the approximate equivalent of 20 square feet of surface, and 35 cubic feet of steam (one H P per minute), although the latter figures do not perhaps look so well on paper.

The value of fresh instead of salt water in the boiler will not be questioned; but gold may be bought too dear. The discussion of the subject, I trust, will induce parties who have the means, to ascertain the *cylinder vacuum* produced by Hall's condenser in comparison with the common method of injection water, and the relative expenditure of power to produce an equal vacuum in the cylinders of steam boats, as well as the relative cost for a continued period, &c. &c.

Whether the results prove the correctness of Hall's statements or the reverse, much credit must remain with him for his success in working (even at some loss) a steam-engine by surface condensation, and that credit is much enhanced by Watt's previous failure.

The "stale disused principle" of one period may become, from improvements in workmanship, the favourite method of a subsequent era. I am no advocate of Hall's condenser, but I am a strenuous advocate for the application of the most severe but fair tests of its value in comparison with salt injection water, the injurious effect of which is so much complained of in marine engines.

The public are, I conceive, bound to give inventions or improvements fair play, but then inventors are under an equal obligation not to attempt to deceive. Trickery or deception on their part, however, is sure sooner or later to recoil with tenfold violence on their heads, and never is, and never ought to be, forgiven by the public.

The government engineers, Messrs. Lloyd and Kingston, appear to have used an incautious expression; evidently referring rather to the vacuum than the means by which it was obtained, and have been charged by "Scalpel" with having "arrogantly ventured to set a limit to man's intellect." "Scalpel" does not seem conscious how much more obnoxious his attempt to set up Watt's authority as final, is to that very same charge. Where would have been the present railway system with its eagle speed had Trevithick submitted to Watt's dicta respecting high steam? How could the *water charge* of the deeper copper mines have been met, had Boulton and Watt's *low pressure engine* remained in use in these mines?

Authority in engineering ought not to be regarded more in England than in America. Now in America it has been found convenient to drive the piston in long-stroked expansion engines from 400 to 600 feet per minute, to avoid gear work for large paddle-wheels. The advantage or disadvantage of this system is a proper subject of inquiry; but to assert that they are wrong because, under other conditions, Watt's opinion was that 220 feet per minute is the proper velocity for the piston of a steam-engine, would evidently be very rash. It has always appeared to me, that the good fortune was quite as remarkable as the talents, which have placed Watt in the foremost rank of inventors. Boulton's energy in the employment of capital in the introduction of the patent engines is too often forgotten by Watt's admirers, as well as the aid he received from Wilkinson and Smeaton, though freely acknowledged by himself. It is impossible to speculate on the results that might have taken place had Messrs. Boulton and Watt been left to their own resources, to improve the boring machine of Wilkinson, and to invent Smeaton's air pump, both of which were essential to the practical commercial success of their engine. The *theoretical invention* had been long completed. His good fortune did not desert him when in the lawsuits his patent was equitably, though illegally, confirmed by the Court of King's Bench, as recently admitted, even by the *Edinburgh Review*. In saying *illegally* I mean contrary to all the received principles of the patent law (perhaps a stronger argument could scarcely be adduced in favour of its amendment). In conclusion, I once more urge both on Mr. Hall and his opponents, the propriety of a reference to facts rather than to certificates or assertions.

I remain,

Yours, faithfully,

S.

June 20, 1840.

RECENT AMERICAN PATENTS.

[*Selected from the Franklin Journal.*]

A MACHINE FOR DRYING FLOUR, &c., *John Balantine and Adam Clark.*—This machine consists mainly of a semi-cylindrical vessel, having a flat top which covers the semi-cylinder; this vessel is to be closed at its ends, but there are to be openings for the admission of steam, which is to pass through it. The flat side is to be placed uppermost, and is to form an inclined plane, that the flour, &c. may descend along it; there are to be ledges at the sides to keep the flour from running off.

The claim is to "the use for drying flour, and other finely divided substances, of a cylindrical segment of any length, and any chord, closed at the ends by caps, and along the chord by a plane, except a passage through the closed segment for the drying agent, as herein described, the drying agent being applied within the closed segment, under the plane, and the flour or other substances to be dried passing along the plane."

Why the claim should be limited to the segment of a cylinder, is not very evident, as it would appear that its upper and lower sides might both be planes, and made similar to the hollow drying shelves, of metal, through which steam has been made to pass, for the drying of powder and other articles. The only novelty, if novelty if it be, is the giving the inclination to the drying apparatus for the descent of the flour.

MANUFACTURE OF HAT BODIES, *Hezekiah S. Miller.*—The invention consists "in

a method by which fur after being carded, picked, or blown, is converted into a continuous web, lap, or sheet, for the purpose of being wound into hat bodies, so as to attain advantageously with fur the same end which has heretofore been attained in relation to wool."

By means of a fan wheel the fur as it is delivered from a carding, or other suitable machine, is blown through a box, or trough, against a revolving cylinder covered with wire gauze, &c. From this it is taken off in a lap, being compressed by rollers, and is then ready to be wound on a former for making hat bodies. The claims are to "the combination of the fan, oblong box, or spout, and cylinder, for the purpose described, and to the combination of the two aprons operating for the purpose and in the manner described; and also these in combination with the combined fan, spout and cylinder, as described."

The resemblance between this apparatus and what has been before patented, or in use, is very close; we cannot take the time, nor do we deem it necessary to examine this point closely, the patent office having no doubt done this before granting the patent; it is to be presumed, therefore, that there was room for the claims made.

Machine for Preparing Brick Mortar, *Oran W. Seely*.—This machine consists of a circular trough in which are two sets of wheels, the peripheries of which are to roll round upon the clay contained in the circular troughs. The wheels are each to have three or four rims, or treads, and they are placed upon a horizontal shaft which has a screw cut upon it, which passes through corresponding screws in the hubs of the wheels, by which arrangement the wheels traverse back and forth on the shaft between the periphery and centre of the tub, the shaft moving on a vertical post, rising from the middle of the tub, and the motion of the horizontal shaft being reversed, when one of the wheels arrives at the end of it. At the outsides, and between the divisions of the wheels there are scrapers to remove the clay therefrom. The claim is to "the employment of scrapers, in combination with each set of wheels." This, it will be seen, is rather a meagre claim, but we are in error if it be not still too broad. Wheels fixed precisely in the way described were patented many years since, and, most certainly, scrapers were used to remove the superfluous clay from them.

Improved Lightning Rods for Buildings, *Joseph S. Barber*.—This is something of a fantastical lightning conductor, the superiority of which over those in use appears to us to be the creature of imagination. A dome-like shell of copper, or other metal, is to be mounted upon a pole which passes through its centre, and gives to it the appearance of an open umbrella. The part of the pole above the dome is to be furnished with points branching out, as frequently practised, and the lower edge of the dome is to be fringed with pieces of metal cut in the form of leaves, surrounded with numerous points. The claim is to "a paraboloid, constructed as above described, and its combination with a set of branching wire points, in the manner described, and for the purpose set forth."

Those acquainted with the early history of lightning conductors, know something of the little-endians, and the big-endians, whose differences might probably have been reconciled by the foregoing combination of a semi-globe, with sharp points.

A Machine for Planting Corn and other Seeds, *David S. Rockwell*.—This appears to be a well arranged machine for accomplishing the intended purpose. It runs upon four wheels, and it is designed to plant two rows at once, at such distance apart as may be desired. Two boxes, called droppers, are attached to the side timbers of the machine, and these side timbers may be removed to a greater or less distance apart. The boxes, or droppers, containing the seed, have slides which are operated upon by the revolution of the wheels, and drop the grain in quantity and distance as may be required. The claims refer to the special construction and arrangement of these parts, to an understanding of which the drawings would be required.

A Machine for Preparing Brick Mortar, *Ansel Teal*.—This the inventor calls an *eccentric Mortar Machine*, and it in part resembles that of Seely, in having a circular trough within which the mixing instrument is to roll round, and is to move back and forth, towards and from the centre. Instead of wheels with rims, three rows of spokes are to project out from a revolving hub placed on the horizontal shaft. The spokes are to be so set as to tend to move the clay towards the centre of the trough, as the horse moves in one direction, and towards the circumference when moving in the opposite direction. The hub does not traverse back and forth on the shaft as in the first described machine, but there is a rack and catch, denominated a sliding gauge, which are to be managed by the attendant when its place on the shaft is to be changed.

The claim is to "the sliding gauge, constructed as described, in combination with the hub and shaft, by which the motion of the hub, with its arms or spokes, is regulated, and they are prevented moving from the centre of the pit faster than the operator wishes."

A MACHINE FOR CUTTING SHINGLES, *Ludlam M. Parsons.*—A knife is to slide up and down, its ends being attached to a frame which operates like that of a saw frame within fender posts. The stuff as it is fed up to the knife bears against a vibrating pannel, allowing a head and point to be alternately cut from each end of the block. There is a contrivance for drawing the block up, and vibrating it and the pannel, and the claim made is to "the vibrating pannel, in combination with the knife, as described."

AN IMPROVEMENT IN THE ROTARY STEAM ENGINE, *Roger M. Sherman.*—A patent was obtained by Mr. Sherman on the 25th of April, 1837, for improvements in the rotary steam-engine, of the same general construction with that which is the subject of the present patent. The improvement now claimed is to "the fitting of a cap to a rotary steam-engine in the manner and by the means set forth, so that the steam by its own pressure shall prevent its own escape." The manner of construction proposed is well calculated to attain its object; we, however, see no reason to dissent from the opinion we have so frequently expressed, adverse to the equality of the rotary to the reciprocating engine, as hitherto constructed. The objection to it we consider as too deeply seated to be removed by any device however ingenious, or however effective, in removing a difficulty belonging to its details, as is the case in the instance before us.

A MACHINE FOR CUTTING POTATOES AND OTHER VEGETABLES, *Abel Williams.*—The novelty upon which this patent was claimed is not of a very striking character, the machine being very much like others in prior use, as will be seen by the claim. The potatoes, &c. are to be put into a hopper on the lower end of which there is a traversing slide, carrying the cutting knife for slicing, and small vertical knives for cutting through the slices; the patentee says, "I do not claim to be the inventor of the mode of cutting vegetables by means of a single edged knife attached to a gate, and cutting against a bed, with small knives having their planes and edges at right angles with the plane and edge of the main knife, such having been invented before mine. But what I do claim as my invention, and desire to secure by letters patent, is the combination of two sets of small knives as herein described, with a double edged knife attached to a gate, the whole being constructed and operating substantially as herein described."

A MACHINE FOR CUTTING STRAW, *Charles T. Botts*—The straw is placed in a trough, and fed up towards one end of it by means of rollers, operating in a known manner. Crossing the cutting end of the trough a conical hub of cast iron revolves, carrying two cutting knives, which, by being placed on the conical hub, have a peculiar drawing motion given to their edges. Parts of the hub are cut away to make suitable seats for the knives.

The claim is to "the giving to the hub upon which the knives are affixed, the form of the frustrum of a cone, in the manner, and for the purpose set forth. And it is to be understood, that by this conical form nothing more is intended than that the portion of the revolving hub, or body, to which the knives are attached, shall be so formed, as for their edges to stand in that direction, which shall cause them in their revolution to generate the frustrum of a cone."

A MACHINE FOR CUTTING STRAW, *Thomas Hopper.*—In this machine there is to be a row of knives placed vertically, at such distance apart as shall correspond with the length to be given to the cut straw. The edges of these knives stand in one plane, and a roller, composed of rings of cast iron placed upon a shaft, revolves so that the peripheries of these rings shall enter the spaces between the blades. There are offsets, or teeth, projecting out from these rings, like the teeth of a saw, say five or six on each ring, and these carry the straw, which is fed on to a sloping board, against the knives, which consequently cut it. The knives are dropped into slots, which hold them in place, and by removing every other knife the length cut will be doubled. If used for corn stalks, the roller and offsets should be larger than for straw. The knives may be like common shoe maker's knives, with the handles removed.

The claim is to "the manner above described of cutting straw, and other vegetable matter, by forcing the same against a row, or series of knives, by means of a cylinder having projections thereon, which, by the aid of grooves pass between the knives or cutters, forcing the material to be cut against them."

A MACHINE FOR THRASHING AND CLEANSING GRAIN, *Matthew M. McKever.* This thrashing machine and cleansing apparatus differs but little in the manner of constructing it, or in its operation, from several others; there was nothing to claim, therefore, but the particular arrangement of the respective parts as made by the patentee. The claim is to "the combination of two fans, and their fixtures, with the thrashing machine, in the manner described; to the shoot board, in combination with the straw shaker; to the shaker, and to the brace spike, or tooth, constructed as described." We do not see anything in the matters claimed, worthy of special notice.

LIST OF DESIGNS REGISTERED BETWEEN 26TH MAY, AND 26TH JUNE, 1840.

Date of Registration.	Number on the Register.	Registered Proprietor's Name.	Subject of Design.	Time for which protection is granted.
May 28	317	J. Yates	Stove	3 years.
"	318	H. Tuck	Envelope	1
29	319	D. Walton	Lacehole	3
"	320	J. Nettleton	Stove	3
June 4	321	C. Griffin	Weight balance	3
"	322	W. J. Curtis	Railway bolster	3
5	323	J. Sanders	File	3
"	324	J. F. Stephens	Tailor's square	3
8	325	Pershouse and Welch	Snuffers	3
"	326	J. Dry	Shaker for corn-dressing machines	3
9	327	A. Solomon and Son	Embossment	1
"	328	R. and D. Chambers	Door lock and key	3
11	329	J. J. Hollingshead	Pen	3
"	330	Ditto	Penholder	3
15	331	Selby and Keartland	Fastening for trowser straps, &c.	3
"	332	Ditto	Ditto, ditto, ditto	3
"	333	The Coalbrookdale Company	Stove	3
"	334	C. Brown	Vase	1
16	335	Bamfield Renno	Draught eyes or tugs of hames for horse collars	3
"	336	Jackson and Jowett	Back straps for waistcoats and trowsers	1
18	337	G. Riddle	Ink and taper light stand	1
19	338	J. Dickson and Sons	Powder Flask	3
"	339	H. N. Turner and Co.	Stained paper	1
22	340	G. D. Dempsey	Candle socket	3
"	341	G. and H. Talbot and Sons	Carpet	1
23	342	W. Ponsford	Envelope	1
24	343	Dixon and Sons	Coffee pot	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN 26th MAY AND THE 26th JUNE, 1840.

Henry Augustus Taylor, of New York, now of Milk-street, Cheapside, merchant, for improvements in the manufacture of braid and plats (being a communication from a foreigner residing abroad. May 28; six months to specify.

Alexander Francis Campbell, of Great Plumstead, Norfolk, Esq., and Charles White, of Norwich, mechanic, for improvements in ploughs and certain other agricultural implements. May 28; six months.

Sir Josiah John Guest, of the Dowlais Iron Works, Glamorgan, baronet, and Thomas Evans, of the same place, agent, for certain improvements in the manufacture of iron and other metals. May 28; four months.

Edmund Leach, of Rochdale, Lancaster, machine maker, for certain improvements in machinery or apparatus for carding, doubling, and preparing wool, cotton, silk, flax, and other fibrous substances. May 28; six months.

Daniel Gooch, of Paddington-green, engineer, for certain improvements in wheels and locomotive engines to be used on railways. May 28; six months.

William Henry Smith, of York-road, Lambeth, civil engineer, for an improvement or improvements in the mode of resisting shocks to railway carriages and trains, and also in the mode of connecting and disconnecting railway carriages, also in the application of springs to carriages. May 28; six months.

George Henry Bursill, of River-lane, Islington, gentleman, for an improved method or methods of weighing, and certain improvements in weighing machines. May 28; six months.

James Allison, of Monkwearmouth, Durham, iron master, and Roger Lumsden, of the same place, chain and anchor manufacturer, for improvements in the manufacture of iron knees for ships and vessels. May 30; six months.

John Babtist Wicks, of Leicester, framework knitter, for improvements in machinery employed in framework knitting or stocking fabrics. May 30; six months.

William Pettitt, of Bradwell, Bucks, gentleman, for a communicating apparatus to be applied to railroad carriages. May 30; two months.

John Hawley, of Frith-street, Soho, watch maker, for improvements in pianos and harps. (A communication). June 1; six months.

Pierre Defaure de Montmirail, of London-wall, gentleman, for certain improvements in the manufacture of bread. (A communication). June 2; six months.

Richard Freen Martin, of Derby, gentleman, for certain improvements in the manufacture of certain descriptions of cement. June 2; six months.

Samuel Salisbury Egales, of Liverpool, engineer, for certain improvements in obtaining motive power. June 2; six months.

James Harvey, of Basing-place, Waterloo-road, timber merchant, for certain improvements in paving streets roads and ways, with blocks of wood, and in the machinery or apparatus for cutting or forming such blocks. June 2; six months.

William Southwood Stoker, of Birmingham, for certain improvements in machinery applicable to making nails, pins, and rivets. June 2; six months.

Christopher Dain, of Edgbaston, Warwick, gentleman, for certain improvements in the construction of vessels for containing or supplying ink and other fluids. June 2; six months.

James Roberts, of Sheffield, merchant, for an improved mode of fastening certain kinds of horn and hoof handles to the instruments requiring the same. June 3; six months.

Samuel Wagstaff Smith, of Leamington, iron founder, for improvements in apparatus for supplying and consuming gas. June 9; six months.

Robert Hampson, of Mayfield Print Works, Manchester, calico printer, for an improved method of block printing on woven fabrics of cotton, linen, silk or woollen, or of any two or more of them intermixed, with improved machinery, apparatus, and implements for that purpose. June 9; six months.

Alexander Southwood Stoker, of Birmingham, for improvements in the manufacture of tubes for gas and other purposes. June 9; six months.

Christopher Nickels, of York-road, Lambeth, gentleman, for improvements in the manufacture of braids and plaits. (A communication.) June 9; six months.

Thomas Edmondson, of Manchester, clerk, for certain improvements in printing presses. June 9; six months.

John George Shuttleworth, of Feamley-place, Glossop-road, Sheffield, gentleman, for certain improvements in railway and other propulsion. June 9; six months.

Francis Greaves, of Radford-street, Sheffield, manufacturer of knives and forks, for improvements in the manufacture of knives and forks. June 11; six months.

William Lance, of George-yard, Lombard-street, insurance broker, for a new and improved instrument or apparatus to be used in whale fishery, part or parts of which upon an increased scale are also applicable as a motive power for driving machinery. June 11; six months.

Benjamin Winkles, of Northampton-street, Islington, copper plate manufacturer, for certain improvements in the arrangement and construction of paddle-wheels and water wheels. June 11; six months.

Joseph Wolverson, of Willenhall, Stafford, locksmith, and William Rawlett, of the same place, latch maker, for certain improvements in locks, latches, and other fastenings for doors. June 13; six months.

Ezra Jenks Coates, of Bread-street, Cheapside, merchant, for certain improvements in propelling canal and other boats. (A communication.) June 13; six months.

Edward John Carpenter, of Toft Monks, Norfolk, commander in the Royal Navy, for improvements in the application of machinery for assisting vessels in performing certain evolutions upon the water, especially tacking, veering, steering, propelling, casting, or winding and backing astern. June 13; six months.

Richard Beard, of Egremont-place, New-road, gentleman, for improvements in apparatus for taking and obtaining likenesses and representations of nature and of drawings, and other objects. (A communication.) June 13; six months.

Richard Prosser, of Birmingham, civil engineer, and John James Rippon, of Well-street, Middlesex, ironmonger, for certain improvements in apparatus for heating apartments, and in apparatus for cooking. June 17; six months.

Richard Prosser, of Birmingham, civil engineer, for certain improvements in manufacturing buttons from certain materials, which improvements in manufacturing are applicable in whole or in part to the production of knobs, rings, and other articles from the same materials. June 17; six months.

Thomas De la Rue, of Bunhill-row, manufacturer, for improvements in printing calicoes and other surfaces. June 20; six months.

John Aitchison, of Glasgow, merchant, and Archibald Hastie, of West-street, Finsbury-square, merchant, for certain improvements in generating and condensing steam, heating, cooling, and evaporating fluids. June 24; six months.

William Hickling Bennett, of Wharton-street, Bagnigge Wells-road, gentleman, for improved machinery for cutting or working wood. June 24; six months.

William Ash, of Sheffield, manufacturer, for certain improvements in augers or tools for boring. (A communication.) June 24; six months.

William Wood, of Wilton, carpet manufacturer, for certain improvements in looms for weaving carpets and other fabrics. June 24; six months.

Joseph Leese, jun., of Manchester, calico printer, for certain improvements in the art of printing calicoes and other surfaces. June 24; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND, SUBSEQUENT TO THE 22ND MAY, 1840.

Thomas Walker, of Galashiels, in the county of Selkirk, mechanic, for improvements in apparatus, applicable to feeding machinery employed in carding, scribbling, or teasing fibrous materials. Sealed. May 26.

James Hadden Young, of Lille, in the kingdom of France, at present residing at 32, Norfolk-street, Strand, county of Middlesex, merchant; and Adrien Delcambre, of Lille, aforesaid, manufacturer, for an improved mode of setting up printing types. May 28.

John Hawley, of Frith-street, Soho square, county of Middlesex, watch-maker, being a communication from abroad, for improvements in pianos and harps. May 29.

Thomas Edmondson, of Manchester, clerk, for certain improvements in printing presses. June 1.

William Potts, of Birmingham, brass founder, for certain apparatus for suspending and moving pictures and curtains. June 2.

Elijah Galloway, of Water-lane, Tower street, London, engineer, for certain improvements in steam engines. June 9.

Francois Voüillon, of Princes-street, Hanover-square, county of Middlesex, silk mercer, being a communication from abroad, for certain improvements in the manufacture of ornamental woven fabrics. June 9.

William Daubney Holmes, of Cannon Row, in the city of Westminster, engineer, for certain improvements in the construction of iron ships, boats, and other vessels, and also in means for preventing the same from foundering, also the application of the same improvements, or parts thereof, to other vessels. June 13.

John Crighton, junior, of Manchester, machine maker, for certain improvements in machinery for weaving single, double, or treble cloths, by hand or power. June 18.

LIST OF IRISH PATENTS GRANTED IN APRIL AND MAY.

John B. Humphreys, for certain improvements in shipping generally, and in steam vessels in particular, some of these improvements being individually novel, and some the result of a novel application of parts already known. April.

W. Craig, and W. Douglas, for certain improvements in Machinery for preparing, spinning, and doubling cotton, flax, wool, and other fibrous substances. April.

W. J. Cookson, for certain improvements in processes or operations for obtaining copper and other metals from metallic ores. April.

John Sutton, for improvements in obtaining power. April.

Sam. W. White, for improvements in preventing persons from being drowned. May.

W. Hunt, for improvements in the manufacture of potash, soda, and their carbonets. May.

T. R. Williamson, for improvements in the manufacture of woollen and other fabrics, or fabrics of which wool, or fur form a principal component part, and in the machinery employed for effecting that object. May.

G. A. Ermer, for improvements in machinery or apparatus for spinning, doubling, twisting cotton, flax, wool, or other fibrous materials, part of which improvements are applicable to machinery in general. May.

Sir W. Burnett, for improvements in preserving animal, vegetable, woollen and other fibrous substances from decay. May.

Thos. Meyerscough, for improvements in the construction of looms for weaving, or producing a new or improved manufacture or fabric, and also in the arrangement of machinery to produce other descriptions of woven goods and fabrics. May.

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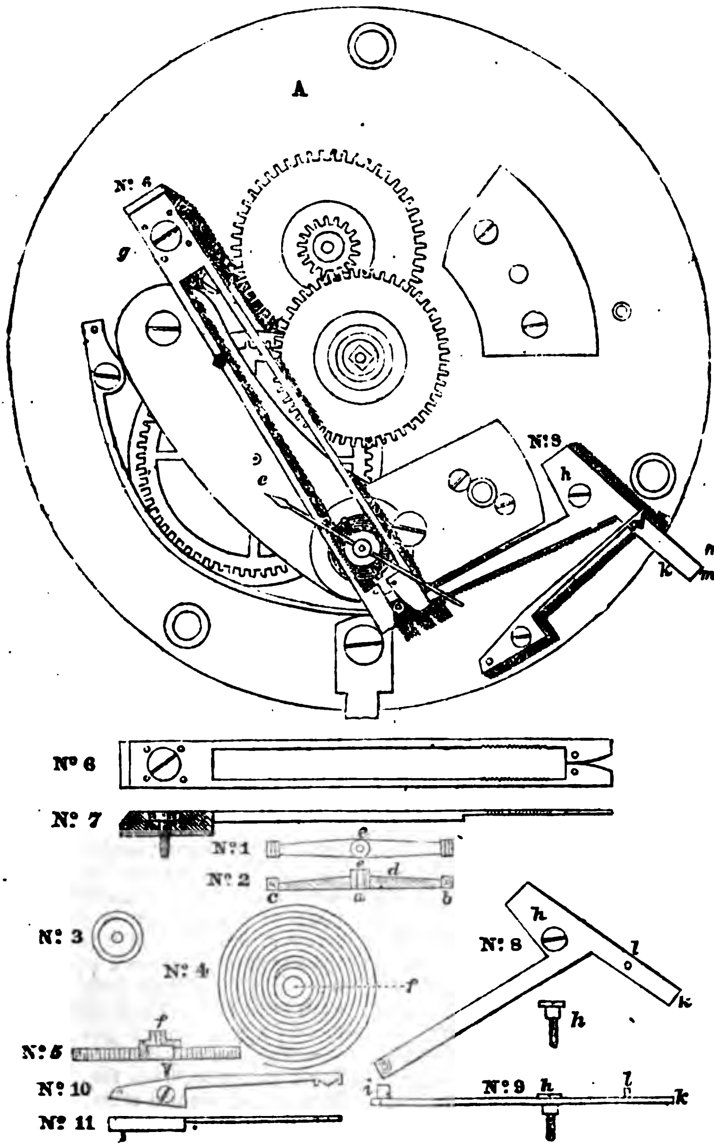
GOUGY'S PATENT STOP-WATCH.



GOUGY'S PATENT STOP-WATCH.

[Patent dated 11th Dec. 1839; Specification inrolled 11th June, 1840.]

The improvement which constitutes the subject of this patent, is one of the most ingenious and useful contributions to horological mechanism, which has been made within our recollection. It enables us for the first time to determine with infinitesimal exactness by means of a common pocket watch—the improvement of course being applied to it—the precise instant of time, at which any particular occurrence takes place—such as an eclipse or occultation of any of the heavenly bodies—the transit of a racer past the winning post—or of a railway locomotive, going at four times the speed of the swiftest racer that ever graced the turf, past any given point of its course. The bearer of the watch has but to press with his finger, a small projecting knob on the outer case at the moment, the moving object crosses his vision, and *the thing is done*. On referring to the dial-plate he sees the instant at which the event took place, indicated by a supplementary second hand—previously concealed from view, in consequence of its being placed exactly under the ordinary second hand, and revolving with it, but now made (by the pressure on the outer knob) fixed and stationary, until the observation is written off, when by another pressure of the finger, this supplementary hand is made instantly to resume its original position, and to rotate with the other hand as before—the second wheel continuing all the while perfectly unaffected and undisturbed. The inventor, M. Pierre Frederick Gougy (late of Paris), who has the good fortune to have associated with him in the working of his patent, one of the most eminent of our English chronometer makers, Mr. French, describes in his specification, seven different methods of carrying the principle of his admirable invention into effect, but we shall content ourselves with extracting from it his description of the first, and what he declares to be, upon the whole "the best" of these methods,—referring to our front page for the different figures described.

"Figure A is a plan of a watch or chronometer (on a scale of double the real size) with the outer case and dial plate removed so as to leave fully exposed to view my said newly invented movement. The figures numbered 1 to 11 inclusive, are detached representations of the different pieces requisite to the said movement. Nos. 1 to 5 inclusive are shown on a scale of four times the real size; and Nos. 6 to 11 inclusive on a scale of double the real size (as in the plan, Figure A.) No. 1 is a plan, and No. 2 a side view of a cross bar or rest, which by means of the hole *a*, in the centre, fits on the pivot of the fourth or second wheel of the watch; *b* and *c* are two eye holes drilled in the extremities of this cross rest for the reception of the circular spring hereinafter mentioned (No. 4), and *d* a vertical pin, which serves as a rest for a supplementary second hand which is placed as hereinafter mentioned below the ordinary second hand. No. 3 is a bottom plan of a hollow drum which fits loosely on the collet *e* of No. 1, and covers it as well as its pin *d*. *d* 2 is a small horizontal pin which projects from the inside of this drum. No. 3 is a top plan of the drum No. 4, and of a circular spring, the interior end of which is attached to the outside of this drum, and the other passed through the eye holes *b*, *c*, at the ends of the cross rest No. 1, and secured at *c* with a pin. No. 5 is a side view in section of No. 4; *f* is a cannon socket which carries the lower or second hand beforementioned. No. 7 is a plan, and No. 6 a side view in section of a double or two-armed detent, which is secured to the watch plate by a screw *g*, and encloses between its two arms the drum No. 5, but without touching the same except under the circumstances hereinafter pointed out. No. 8 is a plan, and No. 9 a side view of a T piece or lever which is secured by a screw *h*, (on which it turns freely), to the watch plate, in such a position that a straight line drawn from the screw *h* shall be at right angles with the detent No. 6; *i* is a vertical pin which rises from the long end of this lever, and on being passed between the chaps or extremities of the two arms of the detent No. 6, keeps the same from pressing against the loose barrel No. 3. K is the

tail of this lever, which protrudes through the outer case of the watch or other timepiece. No. 10 is a plan, and No. 11 a side view of a spring catch which is screwed at one end to the watch plate, and is notched at the other in the manner represented in the drawing, so as to slip to and fro on the pin *l* affixed to the tail of the lever No. 8. The dial plate, which in figure A is left out for the sake of clearness is inserted between the two second hands and the detent. Of these hands the upper one only, which is fixed on the top of the pivot of the *fourth or second* wheel, is visible; the other, which is fixed on the cannon socket of the loose drum is concealed beneath. As the different pieces before described are presented in combination in figure A, the two second hands will move regularly together; but supposing the tail *k* of the lever No. 9 to be moved forward (by hand applied to the outside of the watch) from *m* to *n*, this will withdraw the vertical pin *i* at the opposite or long end of the lever from the grasp of the detent; which thereupon will instantly close upon and stop the loose drum with the lower hand attached to it, while the upper hand will continue to move round as before. The cross rest, No. 1, which is fixed on the pivot of the second wheel will also of course continue to revolve as before, and as it has attached to it one end of the circular spring No. 4, while the other is secured to the outside of the loose drum (which in the case supposed has been made fast by the detent,) the consequence is that the spring begins to be wound up in the same instant that the lower second hand is stopped, and continues to be so till any further collapse is stopped by the horizontal pin *d* of No. 3, which is always in about 58 seconds from the stoppage of the lower second hand. Before the lapse of the 58 seconds the time indicated by the fixed or lower second hand on the dial may in general be readily written off, and as soon as it has been so, the tail *k* of the lever No. 9 should be moved back from *n* to *m*, when the stud *i* re-entering between the chaps of the detent will set free the drum and with it the spring which will immediately restore the lower second hand to its original position below the upper. But should the time of the stop not be written off before the lapse of the 58 seconds, it will still remain indicated by the dial plate, that is to say, to the extent of the seconds circle, for after the lapse of the 58 seconds the cross rest which is fixed on the pivot of the second wheel, and has never ceased to revolve with it, will carry along with it the drum, spring, and lower second hand, but with the lower second hand always 58 seconds behind the other. And so the hands will remain relatively to one another for any indefinite length of time, till by moving the tail *k* back from *n* to *m*, the detent is reopened and the loose drum and spring set free."

ART OF BREWING—PRINCIPLES OF REFRIGERATION. — WIGNEY'S IMPROVED REFRIGERATOR.

Sir,—The intention which I expressed in my letter inserted in the monthly part of your Magazine for May, No. 876, and page 726, to furnish in my next a detailed explanation of the principles of refrigeration, and observations upon the several refrigerators extant, I will now endeavour to effect, and trust that you will oblige me with its insertion in your truly useful work.

That brewers, distillers, rectifiers, vinegar makers and others need information on such a subject, I have frequent and continued proof, as evinced by the erroneous course of reasoning pursued by many, the absence of all elementary knowledge from their minds of the principles on which refrigeration is, and should be effected, and the very injudicious choice they too frequently make of a refrigerator—selecting the least effective, the most costly, the most wasteful, and the least economical in operation, in preference to one possessing all the requisite capabilities, at less cost, and constructed in exact conformity to the defined rules of science.

In this essay, I will confine my observations to the refrigeration of what is called *wort* by the brewer and vinegar maker, and *wash* by the distiller, and arrange my remarks under three heads:—1. The chemical effect produced on wort or wash, by its exposure to, and its refrigeration by the atmosphere; 2. the principle on which the refrigeration of wort or wash is effected by water; and 3. the mechanical structure of a refrigerator to combine

effective power with economy of material in manufacture—of water in consumption—of wort or wash as relates to waste—and of fuel, by the appropriation of the transferred heat to the water.

1. But previous to the discussion, and subservient to the illustration of the first division of the subject, it is necessary to state some important facts, which are well known to most of the manufacturers referred to, yet of which they may need a reminiscence.

The brewer finds that he can brew better beer in the autumn and winter, than he can in the spring and summer. The distiller finds that he can convey to his fermenting tun, a sounder wash in autumn and winter than he can in spring and summer; while the vinegar maker finds that the autumnal and winter months are the most suitable for the obtainment and fermentation of his wort by the vinous process, and the spring and summer months for its ultimate conversion into vinegar, by the acetous process of fermentation. It is, therefore, highly important to those manufacturers, that they should know the cause of such effects, and the means by which they may be obviated, and be thereby enabled to avail themselves of the advantages of continuing the process of brewing throughout the inauspicious months, with as much success as during the more suitable period.

The cause referred to, is the presence of oxygen in the atmosphere in a state of simple mixture, to a much greater amount in the spring and summer months, than in the autumn and winter, and the effect produced, is a vino-acetous, or an acetous fermentation, if too much oxygen is imparted to the wort during any part of the process of brewing or fermentation; and one of the obvious remedies (and the only one which it is my present purpose to impart) for the evil experienced, resulting from its presence to a superabundant amount, for the purpose of effecting a vinous fermentation, is to cause the refrigeration of the wort by water, after the process of boiling, in order to prevent the impartation of too much oxygen thereto, which will occur, if it is too extensively and for too long a period exposed to atmospheric air.

Having pointed to the cause and the effect, it next becomes an interesting and important subject of enquiry, to ascertain under what peculiar circumstances, wort or wash is liable to derive too much oxygen by absorption from the atmosphere, during the spring and summer months, from the period of ebullition to the time of pitching.

It is first necessary to state, that the impartation of oxygen to wort between the period of boiling and pitching is necessary to enable the process of vinous fermentation to commence and proceed. But that the impartation of a small quantity only is sufficient, is evidenced by the sufficiency of the supply during the autumn and winter, when the quantity present in the atmosphere in a state of simple mixture is small, and also when wort is promptly and with very little exposure to the atmosphere, reduced from boiling heat to the pitching heat, by the medium of water, during those months, as well as those of spring and summer. Hence it necessarily follows, that as during the latter period, oxygen is present in the atmosphere to a superabundant amount as relates to vinous fermentation, and to a sufficient amount as relates to an acetous fermentation, therefore any unnecessary exposure of wort to the atmosphere from the time it is boiled, until reduced in temperature to the pitching heat, must render such wort liable to receive too much oxygen, and consequently subject to a vino-acetous or an acetous fermentation.

If, then, this view of the subject is correct, it follows as a matter of course, *that cooling backs are superfluous in autumn and winter, and worse than useless in spring and summer.* That such is the case has been practically proved by myself and others, inasmuch as we have ascertained, that wort may pass direct from the vessel in which it is boiled, through a refrigerator into the fermenting tun, reduced in temperature to the pitching heat, without any exposure to the atmosphere during its progress; and in the autumn and winter as well as the spring and summer, will derive from the atmosphere between the period of pitching, and the commencement of fermentation, a sufficient quantity of oxygen, for all the requirements of a proper vinous fermentation; and inasmuch also, as it has been experienced by others and myself, that by too extensive and too long exposure of wort to the atmosphere in

cooling backs in spring and summer, not only has a vino-acetous or an acetous fermentation occurred in the fermenting tun and cleansing casks, but upon some occasions the wort has evidently become acid to the taste, before its transition from the cooling backs to the fermenting tun.

Having shown that the presence of too much oxygen in a state of simple mixture with the atmosphere, for the effectuation of a sound vinous fermentation, renders wort liable to a vino-acetous or an acetous fermentation, by its too extensive and too long exposure to the atmosphere, it necessarily follows that although air, as a refrigerating medium, is not chemically injurious to wort during the autumn and winter, in consequence of the minimum amount of oxygen present, and the diminished temperature of the air, decreasing the liability of its impartation, yet that in the spring and summer, it is as a refrigerating medium chemically injurious, both as relates to the quantity of oxygen present, and the increased liability of its impartation, resulting from the high temperature of the atmosphere; and if atmospheric air is as a refrigerating medium injurious, it follows as a matter of course, that the more extensive, and the longer the period of exposure to the wort or wash thereto, the greater must be the chemical evil which it must experience.

The next point of inquiry which this subject presents, is, at what period during the process of refrigeration of the wort or wash by the atmosphere, is it liable to derive too much oxygen therefrom? The reply to such a question is, when in a receptive, and not in an emissive state. Wort is an emissive state when emitting vapour from its surface during the process of cooling, and when ejecting carbonic acid gas and yeast during the process of fermentation, and the period between is its receptive state. The next and final question then is—at what period of the receptive state of wort or wash, is it the most liable to receive too large an amount of oxygen from the atmosphere? And the important reply to this question is, from the time it ceases to emit vapour in the cooling back, until its reduction in temperature to 80 degrees of heat. To illustrate the correctness of this reply, it may be sufficient for me to refer to the temperature of acetification adopted by the vinegar maker in his stove-room, which is not less than 80 degrees, at which heat he finds the impartation of oxygen to his wort from the atmosphere is best effected; and so well is he satisfied, that the source from whence is derived the oxygen which he requires for the acetification of his wort is the atmosphere, that he will not allow the furnace which furnishes heat to his stove-room, to be supplied with air from the stove-room, to support the combustion of the fuel therein, because it is the oxygen of the atmosphere which is the aliment to support combustion, and if the supply requisite for such purpose were received from that room, his wort would be robbed of the aliment to effect its acetification.

From these several facts, therefore, the conclusive deduction must be, that in spring and summer, wort or wash ought never to be refrigerated by the atmosphere, nor yet exposed to its access to a greater extent of surface, or for a longer period than is unavoidable; and if for the economy of labour and use of water, a portion of the heat is allowed to be abstracted by the atmosphere, yet the process of refrigeration by water, should be effected before the wort or wash ceases to emit vapour. Such being the case every brewer, distiller or vinegar maker, who, from necessity or choice, brews at the inauspicious period of the year, should be provided with a refrigerator, powerfully effective, consuming a small quantity of water and wasting none, and causing no extra labour.

Having shown the chemical effect produced on wort or wash by its exposure to, and its refrigeration by, the atmosphere, I will now proceed to discuss the second head,—The principle on which the refrigeration of wort or wash is effected by water.

2. By the admirable law to which caloric is subject, the same wort or wash which has been raised to the temperature of ebullition, by the transition of caloric from the burning fuel to the wort by the law of equal diffusion to which it is subject, may also be reduced in temperature to the abstracting medium by a similar transition; and in addition to the chemical injury sustained by wort or wash in hot weather, when refrigerated by the atmosphere, such medium is not ef-

fective to the extent required, when its temperature exceeds the requisite pitching heat of the wort or wash—an objection which also applies to water, which has been raised to the temperature of the atmosphere by exposure thereto. But the manufacturers mentioned are, or ought to be, provided with a source of supply of water, not only suitable to reduce the temperature of their wort or wash to the requisite pitching heat, but also fit for use for the several purposes of the brewery, after it has been used for refrigeration. And again, we find that by the admirable economy of nature, a suitable provision is made for such as can and will avail themselves of it; for as the temperature of water in the bowels of the earth (as a rule) does not exceed 54 degrees, and as the requisite pitching heat of wort or wash is not so low, so therefore all those who have the means of drawing their supply of water from a well, are in possession of a most suitable refrigerating medium.

A suitable supply of water being obtained for the two-fold purpose of refrigeration and the several other uses of the brewery, it becomes a subject of primary importance that such water should be conveyed to the liquor back, or any required utensil, through the refrigerator, without extra labour or occupation of time; that in its progress it should abstract the necessary amount of heat from the wort; that such heat should be retained by the water, and that a saving should be effected by the subsequent appropriation of such water, to an amount equivalent in value to the cost of as much fuel, as would raise the temperature of that water as many degrees as it will attain in its passage through the refrigerator.

In the accomplishment of this important object of economy, it is highly necessary that the mechanical construction and fitting up of the refrigerator, should not only be well adapted to admit of the facility of the passage of the water, from the well to the liquor back and elsewhere, but that it should also be constructed on the best scientific principles, in order to effect the abstraction of the whole of the requisite amount of heat from the wort, by the least possible quantity of water, or with such a quantity as may not exceed the required supply for the brewery; and the accomplishment of such an object will furnish to the brewer a sufficient quantity of water raised to a high temperature, without the cost of any fuel, or the waste of any extra time or labour.

3. Having exhibited the desideratum in theory, it now devolves on me to prove to those addressed how they may obtain the object of their wishes for practical purposes; but instead of requesting their credence to a bare, unconvincing, and unsupported declaration, I will endeavour to satisfy their minds by reasoning on the subject, and to convince their judgments by the conclusive deductions which I think must result from the course pursued; and I am the more inclined to adopt this method, because it is my intention strongly to recommend a refrigerator of my own invention, and that being the case I am fully aware that a suspicion will be very naturally awakened as to the correctness of my conclusions as to its merits, if not of my statements.

The refrigerator which I have invented is capable of reducing the temperature of wort from 212 degrees to 60 or lower, with a quantity of water in the ratio of two barrels to one barrel of wort, and it will cool as many barrels of wort per hour as may be required, from the extent of 8 barrels to 100, and the temperature of the water employed to effect it, may be raised from 54 to 130 degrees.

Here then is a plain, straightforward, and positive declaration made, and nothing is wanting but the proof.

I have before stated that caloric is subject to the law of equal diffusion, and in addition it is necessary to state, that beyond the point of equality its transference cannot be effected. It may therefore naturally be asked, if two barrels of water at 54 degrees of heat, are placed in juxta position with one barrel of wort at 212 degrees of heat, with a medium between, or even if intimately blended together by admixture, how is it possible that the temperature of the wort can be reduced to 60 degrees or lower, and the temperature of the water raised to 130 degrees, since the mean temperature of the admixture will be 106⅔ degrees, agreeably to the law of equal diffusion to which heat is stated to be subject, and not capable of transposition beyond the point of equality? The reply to such a question would be "impossible" if the

wort and water in juxta position were to remain in a quiescent state, or in a state of motion, provided they travel together in the same direction, or even if they travel in an opposite direction, unless the distance which each has to travel, or the surface of radiation be in that relative proportion, as to admit of the transference of the heat of the wort to the water, so as to reduce the former, and raise the latter to the temperature stated. But to comprehend how this may be and is effected, let us suppose that a pipe 152 feet in length is inserted in another pipe of equal length, the internal pipe being of such a diameter as will enable it to hold one barrel of wort, and the external pipe of such a diameter as will enable it to contain both the internal pipe and two barrels of water; and let us further suppose that the external pipe is filled with water at 54 degrees of heat and so remains stationary, while a barrel of wort at 212 degrees is allowed to run into the inner pipe, at such a speed that it shall lose one degree of heat at every foot space which it travels, and the water shall gain half a degree in heat. It will be evident that by the time the first portion of wort which entered the pipe arrives at the opposite end, it will be reduced in temperature to 60 degrees, having lost 152 degrees by the abstraction of the water, and that the water at the opposite end, or the end at which the wort enters, will be raised to 130 degrees, having acquired 76 degrees by abstraction from the wort. We have then only further to suppose that a continued supply of water is allowed to run through the external pipe, and a continued supply of wort through the internal pipe—both water and wort running at such a proportionate speed as that one barrel of wort shall pass through in the same time in one direction, as two barrels of water run through in the opposite direction, and then we have the principle of the refrigeration of wort by water at once exemplified.

Having stated as much as appears to me to be necessary in this communication, relative to the principle on which refrigeration is effected, it now devolves on me to offer a few observations on the various refrigerators extant, but as it is not my intention to point invidiously to the defects in the principle and mode of construction of any one, my remarks will be general, and their purport to show the requisite conditions of construction to render a refrigerator the most effective and economical in operation, rather than to point out the departure from those conditions in many refrigerators that are now in daily use.

Agreeably then to this determination, I have *first* to state, that having shown the advantage of pumping water from the well through the refrigerator to the liquor back, it is necessary that it should be composed of a material of great tenacity, or else of a requisite thickness to enable it to bear the pressure to which it will be subject; but as the thicker the metal the less will be its transmissive power of heat, so the thinner the metal and the greater its tenacity, the more suitable will be its properties for a refrigerator. In the *second* place I have to state, that the larger the diameter of a pipe the less is its strength, or capability of sustaining pressure, and therefore the larger the pipes which are used in the construction of a refrigerator the thicker must be the metal of which they are made, to enable them to sustain the requisite pressure, and consequently the less will they be adapted for the transmission of the heat of the wort to the water. In the *third* place—as the content of four half-inch pipes are only equal to the content of a one-inch pipe, and as the content of sixteen half-inch pipes are only equal to the content of a two-inch pipe, and as the circumference of four half-inch pipes is about six inches, and the circumference of a one-inch pipe is about three inches: and again, as the circumference of sixteen half-inch pipes is about twenty-four inches, and the circumference of a two-inch pipe is about six inches, so if wort is refrigerated by the same quantity running through four half-inch pipes instead of a one-inch pipe, or sixteeen half-inch pipes instead of a two-inch pipe, it will be found that the radiating surface, or the surface presented to the water for the abstraction of the heat from the wort, will be in the four half-inch pipes, in the ratio of six inches, as to three inches in the one-inch pipe; and that it will be in the sixteen half-inch pipes, in the ratio of twenty-four inches, to six inches as in the two-inch pipe. In the *fourth* place, as the distance from the centre of a half-inch pipe to the periphery or circumfer-

ence is a quarter of an inch—as the distance between the same points in a one-inch pipe is half an inch, and in a two-inch pipe one inch, so if wort is refrigerated by passing through half-inch pipes instead of a one-inch pipe, or a two-inch pipe, the heat contained in the wort will have to travel to the water in the half-inch pipes to a distance in the ratio of but one-half that it will have to travel in the one-inch pipe, and but one-fourth the distance that it will have to travel in the two-inch pipe, and consequently the facility and the celerity of the abstraction of the heat from the wort by the water, will be in the same proportion.

Having shown the advantage of constructing a refrigerator of the thinnest metal possessing the requisite and greatest proportionate tenacity; it will be sufficient for me to say that I have chosen copper for the construction of mine, which copper is tinned to render it innoxious; and having also shown that by the employment of half-inch pipes, instead of pipes of one or two inches diameter, that a much greater radiating surface for the abstraction of heat is obtained, and also, that as the heat has a much less distance to travel to the abstracting medium, so is the facility and celerity of the refrigeration proportionably increased, it will again be sufficient for me to say, that in the construction of my refrigerator I employ half-inch pipes for the wort to pass through, which pipes are inserted in a cylindrical pipe of sufficient diameter for the required purpose; and that as the wort passes through the half-inch pipes in one direction, the water circulates around them, and passes through the pipe in which they are inserted, in an opposite direction. Moreover it must be obvious that in the choice of the cylindrical pipes, I have selected the form which is capable of sustaining the greatest pressure; and as the whole of the refrigerator is constructed of copper pipes, brass union screws, and brass cocks, arranged and fitted up with the greatest attention to effectiveness, soundness, cleanliness and economy, and occupies no room in the brewery which is needed for other purposes, it must prove in every sense of the word a refrigerator of the greatest present and ultimate value to the brewer, the distiller, and the vinegar manufacturer.

The preference which a person gives to an apparatus of his own contriving is quite natural, and therefore his recommendation of it may be deemed excusable; and as I frankly acknowledge that I have an interest in promoting the use of this refrigerator, and consequently in endeavouring to induce others to give it the preference, I have availed myself of the present opportunity to furnish your readers with an elementary knowledge of the subject of refrigeration, by which they may be able to test the value of the principle of construction upon which my refrigerator, or that of any other person may be constructed, leaving those who are interested in the subject, to make inquiries as to the practical merits of each, promising to such as need information relative to mine, satisfactory proofs and references as to its merits. And as my object in this communication, is merely to place my own in a prominent point of view before the public, and not to depreciate the merit of other men's inventions, I refrain from saying more, than that my refrigerator is now in use in six breweries out of nine, brewing four quarters and above, in this town, in which the apparatus was contrived, and first used, and consequently where its utility could be best appreciated. I am,

Sir, your obedient servant,

G. A. WIGNEY.

Brighton, June, 1840.

PROGRESS OF STEAM NAVIGATION.

Sir,—During the discussion in your pages a few weeks back respecting the comparative merits of the long and the short stroke in marine steam-engines, some of your American correspondents took no small trouble in endeavouring to account for the *well-known* superiority in speed of the Transatlantic steamers. Now was this any thing more than a genuine specimen of the spirit of Jonathanism? Does this superiority exist at all, or do our American friends "walk into us," as Charles the Second did with the Royal Society, when he requested an elucidation of the strange fact that a jar of water *with* a fish in it weighs no more than the same jar *without* a fish? Marvellous tales have from time to time been told in those trustworthy chronicles, the Yankee newspapers, as to the rapidity of their steamers, but I do not know of a well-authenticated account of any,

even the best of their boats, exceeding the performances of our crack Gravesenders. Some time ago, indeed, there did appear in your columns a tolerably minute account of a wonderfully-quick passage of an American sea-going steamer, solely by the agency of its machinery, accompanied (*selon les régles*,) by an essay from an American resident here towards discovering the source of its amazing go-aheadative powers; — but, alas! this same gentleman, and all his countrymen were quite silent when, shortly after, the question was propounded, how this miraculous vessel contrived to go faster even than its paddles revolved, — which, must have been the case according to the particulars supplied!! Most of the stories of the same description would fall to pieces in the same way, if the materials for testing their correctness were always to be had; —but the newspaper scribes generally take pretty good care of that matter. That respectable authority, Professor Renwick, it may be observed, after retailing some of these staggering stories, remarks that the fastest passage he ever "assisted in" himself, where the boat had no undue advantage from other sources than steam, was at the rate of eighteen miles an hour. The Professor regularly takes it for granted that this speed is a sufficient guarantee of American superiority (it was on board one of their first-rate North River boats, the fastest they have,) not being aware that the rate he thinks so much of has sometimes been exceeded so much as two miles per hour by the *Ruby* Gravesender, and that it is often obtained by that vessel, and many others in the Thames, both river and sea-going. But leave Jonathan alone for "asking for enough;" he has so long regularly arrogated the palm to himself, as a matter quite of course, that he has succeeded in raising a very respectable notion abroad, and at home of the substantiality of his claims.

It is rather singular that the Americans should look on with so much comparative apathy at the progress making by the Britishers in the steam navigation of the ocean. Two years have now elapsed since the Atlantic has been breasted by English steamers, and as yet not a single American one is afloat. This is passing strange: Brother Jonathan may indeed hold it a more agreeable thing to be blown up on one of his own rivers than in the middle of the ocean; but such trifles were not wont to be much regarded by his "speculative eye." Meanwhile the carrying trade, of which he used to think so much, is fast getting into our hands. The *British Queen* brings the news of the sensation excited at Boston by the arrival there of a steamer from Liverpool: and she will be quickly followed by others from and to the same ports, four first-raters being already completed, and ready to commence the monthly mail-line to Boston *via* Halifax, in pursuance of the contract entered into with our government by the Mail Steam Packet Company; a contract involving the outlay of no less a sum than half a million,—not of dollars, but pounds sterling!

The spirit of rivalry so universally dormant in the American breast, has however been awakened in another quarter. The French have determined to attempt setting up an "opposition coach" in the shape of a line of steamers from Havre to New York. From the report drawn up by the French cabinet minister, M. Salvandy, on this occasion, in consequence of the recommendation in which the line has been determined on, it would appear that our ancient foes regard the start we have taken in steaming with the greatest jealousy, and that they are of opinion it should be made an object of national concern to keep pace with us, if possible, in that particular. The Havre packets are consequently to be built and run by the government, without whose assistance no enterprise of the kind, indeed, could be brought to bear, across channel. It might be as well, peradventure, if a little more attention were paid to the railway system in France itself, before assisting in paving the way across the Atlantic; otherwise the Havre speculation will not succeed in attracting many travellers from the North of Europe, who will save time and trouble by crossing the Straits and embarking in England, instead of wasting their energies on the wretched roads and wretcheder cattle of France,—to say nothing of the probability that our steamers may go a trifle faster than theirs, even though they may be fitted (as usual in foreign parts) with English engines, and manned, (as is also usual) by English engineers.

It is not on the Atlantic alone that our neighbours look at the progress we are making with an envious eye. English

steamers cross them in every corner of the world; they complain, that by means of our Indian steam-line, even the Red Sea has been rendered "little better than an English lake." Poor fellows! there is little comfort for them in store. Two magnificent vessels, the *Peru* and the *Chile** have just started, or are on the point of starting, for the western coasts of South America, touching first at Rio Janeiro, and then proceeding through the once terrific Straits of Magellan. Their ultimate destinations are Valparaiso and Lima, and they are intended to remain in that quarter, occupied in keeping up the communication between the several ports on that side of South America, and in due time, it may be confidently expected, in forming part of a steam line from England to Australia and New Zealand *via* the Isthmus of Darien, which *must* be crossed, ere long, by either a canal or railway. What, with the shortening of the distance by adopting the Mediterranean line, combined with the power of steam, the passage to India is now reduced to a third of its ancient distance,—reckoning by time. It is probable enough, that by the means here indicated, the way to the Antipodes may in a few years be similarly shortened, and a trip to Botany Bay made of no more consequence then, than a jaunt to Constantinople is at present.

Speaking of "a jaunt to Constantinople," reminds me that it is not the English alone who are active in promoting the march of steam, however much they may be in the van—the most favourite way of reaching the city of the Sultan, now being by means of the steam vessels on the Danube, whose establishment, and the necessary works in deepening the shoals of the river, reflect so much credit on Austrian and Hungarian energy and perseverance. The rivers of Europe generally are now every where pretty well supplied with the non-regarders of wind and tide, those even of Spain and Portugal not excepted, with all the sluggishness of those countries in the adoption of improvements in the useful arts; the Tagus and the Guadalquiver, are now familiar with the echo of the paddle-wheel, oftenest indeed aroused by the foreigner, but sometimes by native vessels, if the machinery be from another land. The great Northern inland sea, the Baltic, has been for some time tolerably well supplied; there are steamers from Lubeck to St. Petersburgh, as well as to Copenhagen, Elsinore, Nystad, Abo, and almost every place in the Baltic or its gulfs. The stormy coast of Norway—also despite the terrors of the Maelstrom—boasts its "regular line of packets;" a line too, established, as all other lines of communication (railways to wit) appear now-a-days to be, for purposes of pleasure as well as business. The usual trip is from Christiana, the capital, (or one of the capitals) of Norway, to the city of Drontheim, but the directors advertise that about Midsummer a vessel will start from Drontheim for Hammerfest, a town within a short distance of the North Cape itself, the object being neither more nor less than to afford passengers the opportunity, only enjoyable at that northern extremity of Europe, of *seeing the sun rise for a day of six months duration!* Truly, we live in strange times. Spending the vacation in a trip up the Mediterranean, with a saunter through Palestine, so common now, would have seemed incredible enough a very, very few years ago; but taking a voyage to the northermost point of Lapland, by way of a pleasure trip, must be allowed to reach, as brother Jonathan would have it, a "long chalk" beyond that. By land or sea, STEAM is still the great magician, and doubtless, he has wonders yet in store for us, beside which, these must hide their diminished heads—so much the better; may his progress every where be prosperous, and may England ever, as now, be at the head of "the movement."

Yours respectfully,

H.

London, June 24, 1840.

* Both these vessels, we are glad to find, have been fitted with Captain Smith's paddle box safety boats. No far sea going ships should be without them.—Ed. M. M.

BLEACHING PROPERTIES OF CHROMIC ACID.

Sir,—As you have given insertion, in your 880th number, to a letter from Mr. Peter Ward, wherein he claims the priority of the discovery of the bleaching properties of chromic acid, I am sure you will do me the justice to insert the following brief account of my progress in the use of this agent, from the time of its first suggestion to my mind, to the

date of my patent, viz.: the 8th of March, 1836. In evidence of the facts, here stated, I could, if required, bring forward many manufacturers and professional gentlemen of the highest standing; I trust, however, that I am sufficiently well known, to obtain full credit as to the truth of my assertion.

I have been for nearly twenty years engaged in extensive experiments on animal and vegetable oils, and, so early as the year 1830, I employed chromic acid in refining them, having been led to its use by a knowledge of the readiness with which it parts with its oxygen when placed in contact with animal or vegetable bodies. I used it first on linseed oil, then on rape oil, and subsequently on tallow and palm oil. In the years 1832, and 1833, I was engaged in bleaching palm oil at several factories, at the East-end of the Town, and for one of the largest importers in London, and then it was that, after numerous experiments, I was enabled to bring to perfection the process which is now the subject of my patent: I found, that when used in a concentrated state and in combination with muriatic acid, its bleaching power was so intense and instantaneous, that it removed the colour completely in two minutes.*

It will readily be accredited by any one conversant with the subject, that some considerable time must have been expended in bringing the process to perfection, previous to obtaining a patent—that being sealed in March, 1836; taking this argument alone in corroboration of my statement, I may fairly be considered to be *as* early, at least, as Mr. Ward. But the facts already stated, will, I trust, show, beyond all doubt, my long priority.

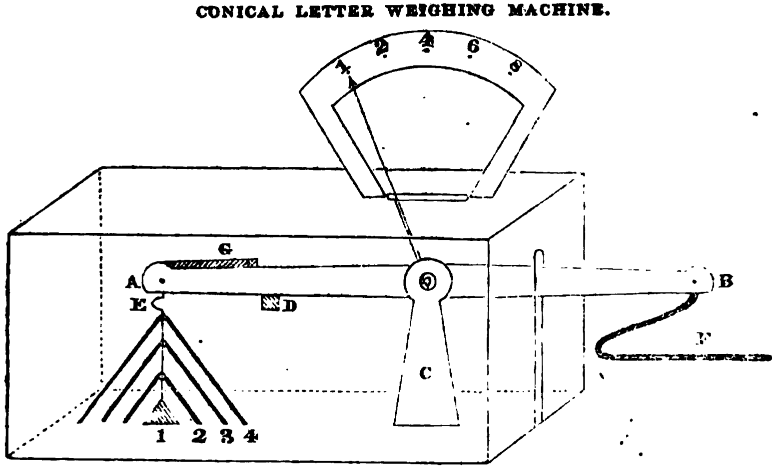
I have never yet taken or borrowed any idea from any one, nor will I ever so degrade myself; nor do I wish for one moment to infer that Mr. Ward would do so. I cannot, however, conclude without observing that, since the date of my patent, I have been informed that the power of chromic acid, in bleaching oils was known in Scotland, long before it was either to Mr. Peter Ward, or to,

Sir, your much obliged, and obedient servant,

CHARLES WATT.

June 25, 1840.

CONICAL LETTER WEIGHING MACHINE.



Sir,—I beg to send you a drawing of a machine for weighing letters which I have invented.

A B is a beam supported on the fulcrum C, one end of which carrying the letter pan F projects beyond the end of the oblong box. The end A is weighted at G to the extent of half an ounce more than the other end of the beam, and rests upon the prop D, in which situation the

* For a full description of my process for bleaching animal and vegetable oils, see *The Chemist*, No. IV.
C. W.

index which is fixed to the beam points to the figure I on the scale. No. I is a conical leaden weight of half an ounce; 2, 3, and 4 are conical leaden or brass weights of one ounce each, exceeding in height the weight No. 1, and each other by similar spaces. A thin silken cord is fastened at the end of the beam and to the top of weight No. 1, passing through smooth holes in the tops of the other weights—this cord is slack when the beam is at rest and is of such a length that on the descent of the letter pan when the index arrives at 2 it is then tight and begins to raise the weight No. 1; when this weight is lifted to the top of No. 2 the index is at 4; when Nos. 1 and 2 are lifted to the top of No. 3 the index is at 6; and when the three weights, 1, 2, and 3, are lifted to the top of No. 4 the index is at 8. Now, on placing a letter in the pan, if its weight does not exceed half an ounce, the machine remains at rest, the index pointing to 1, (the figures on the scale represent *pence* and not *ounces*,) *i. e.* denoting that one penny must be paid. If the letter exceeds half an ounce, but not one ounce, the silk cord is tightened and the index is at 2, or twopence. If the weight exceeds one ounce, and not two ounces, the weight, No. 1, is lifted to the top of No. 2, and the index is at 4 on the scale, or fourpence must be paid, and so on to the extent of 8*d.* postage. Beyond which, this machine will not act, unless additional conical ounce weights be superadded.

I grant that nothing can be so correct as a good plain balance and weights; but there are two or three objections to the use of them. The weights are troublesome, requiring to be taken in and out, and are apt to be lost, and even having ascertained the weight of a letter, you then must calculate the postage, which, to many persons is extremely puzzling. Now, with this machine, all you have to do is to put the letter in the pan, and the index at once points to what the proper postage is, not stopping at any intermediate space, but going direct to the proper figure; and on taking the letter out again, the weights immediately readjust themselves, and the machine is ready for future use. I can only add, that I have made one myself, and that *in practice* it completely answered, being preferred by myself and friends to any we have yet seen. Yours faithfully,

W. SCARFIELD GREY.

1, Cloisters Temple, June 2, 1840.

THE NEW THEORY OF THE UNIVERSE. (SEE VOL. XXXII., PP. 552, 722.) A FEW THOUGHTS IN CONTINUATION.

"*Some have in readiness so many odd tales, as there is nothing but they can wrap it up into a story to make others carry it with more pleasure.*"—Bacon.

An honest miller, whose sphere of observation had never extended beyond a circuit of six miles round the headweir of his own mill, which was situated near the source of a large river, excused himself to an impatient customer, by complaining of the small quantity of water which supplied his mill. "There is a good mill to be disposed of ten miles lower down," said the customer, "you had better buy that." "Nay," replied Whitehat, with a grin, "that would hardly mend the matter. If my mill, so near the source, has but little water, a mill ten miles lower down can have scarcely any."

Now, Sir, when an astronomer tells me that the planet Mercury has seven times more heat than the earth has, it seems to me (according to my new theory of the universe) that the miller and the astronomer are somewhat alike. The former never suspected that the force of his mill-stream might be increased by the accession of other streams; the latter appears not to suspect that the force of the sun's heat, may be increased by the heat of other bodies.

I have said in a former paper, that the progression of a globe, in a circular direction, would prevent the effect of sunlight—a continued succession of light, in a direct line, being necessary to produce that effect. But for the diffusion of heat,—the progression of globes, at different distances, round a heat-imparting globe, in a centre—no better method, without the bodies materially interposing with each other, could be adopted. And if every circulating body contributes its share of additional heat (which I see no reason to doubt), why may not men, and women, and children, enjoy themselves, and return thanks to their maker, in Mercury and Saturn, without the risk of being suffocated by heat in the one, or pinched to death by cold in the other?

Are the sun's rays so simple, so alike in colour, heat, and nature, as to afford no room for suspicion that they may have acquired some of their properties in their way hither? I only presume to

ask the question. For although light does not unite with light, as water does with water, yet it appears to me possible that all that we call sunlight, does not immediately proceed from the sun, any more than all the water in a river from one spring.

[I gave you reason to suppose, Mr. Editor, that my theory lay very much out of the beaten track. Whenever you find it too much so for your readers, you are at liberty to say "enough."]

I remain, Sir, yours, &c.,

E. N. M.

MR. HALL'S SYSTEM OF CONDENSATION.

Sir,—Your readers must not be led away from the real point at issue, either by the noise of "Tomahawk," or by the "calm and dispassionate investigation" of "Another Pioneer in search of Truth." The latter observes, somewhat at variance with the character of a calm investigator, that "Scalpel's object appears to have been to produce a slashing article, *under pretence of coming forward to defend that which has not been attacked.*" Has "Scalpel," indeed, so far forgotten what is due to the *Mechanics' Magazine* as to make its pages the vehicle of uncalled for attack, or unnecessary discussion? He refers to Mr. Peterson's letter in the 873d Number in justification. The question in truth, and it is not an unimportant one, turns solely upon the superiority of condensation by surface, there and elsewhere insisted on. "The great increase of power derived from the use of the patent condensers," stated to be "self-evident," simply because a vacuum of 30½ is obtained, has been repeated with such frequency and confidence as might perhaps entitle the assertion, after it had appeared uncontradicted in the pages of a scientific journal, to be classed among the admitted truths of science. "The cleanness of the boilers" is not the leading subject; it is only casually referred to at the end. "Scalpel" could not act with greater fairness. He first stated, more fully than the advocate of the superiority of Mr. Hall's system, the evils of using the external water. He observed, "that by its use the boilers became encrusted, require frequent chipping, and last only four, five, or six years, and that a greater consumption of fuel was also necessary; he then "admitted at once that Mr. Hall's plan prevents the encrustation of the boiler, and thereby saves them." "But we have to do chiefly with the principle of the two," is Scalpel's declaration for his strictures, and he considered that in estimating the value of an invention "so successful as to leave nothing to be wished for," the means were a fair subject for inquiry. "Scalpel," too, gave full credit for the "unexceptionable testimonials in its favour." He did not mean to express, because he did not feel, contempt for those who differed in opinion. He knew that the facility of obtaining certificates was a serious injury both to the capitalist and the inventor, and he believed that those in question were given without that deliberate investigation which responsibility to the public required, particularly when in favour of a costly, complicated, and unsound system, long abandoned by the greatest experimentalist on the steam-engine. "Scalpel" desired simply to prevent a continuance of an evil which will tend, more than any one thing, to discourage inventive talent, by the difficulty of finding patrons from a want of confidence in the opinions of scientific men.* "To reform and not to chastise I am afraid is impossible," is part of a letter from Pope to Dr. Arbuthnot, so excellent that "Scalpel" hopes to be excused for following such authority.

Having thus, I trust, set myself right in bringing back the question to its true issue, permit me to observe that I should be well content to leave the subject to the calm investigation and judgment of the public, my facts not having been contradicted, nor my observations thereon in the least degree weakened, much less proved erroneous. But your editorial comment on "the talent and good sense" of the last letter in further support of a system, which I believe in good faith, has several fatal objections, is entitled to my respect. It may also perhaps induce your readers to expect a reply from "Scalpel." Under this impression I return to the subject, to meet "Another Pioneer" on that high ground on which, he correctly points out, truth should alone be sought. One, however, who writes so well in the spirit of calm and dispassionate investigation, will not fail to discover that "Scalpel's" reply, in a style unworthy of him, and assuredly unsuited for a mere scientific inquiry, was provoked by such sweeping charges of "prejudice, interest, or ignorance," as rendered it not altogether uncalled for to put a stop to similar assertions of future writers, at the same time that the fallacies of the system were exposed. We do not offer a glass of Lafitte to the ploughman. The elegant film would be broken in

* Observations on this evil formed the subject of "Scalpel's" second paper referred to in the Notices to Correspondents, No. 880.

the coarse grasp, or his uncultivated palate be unequal to distinguish the delicate bouquet of an exquisite vintage. We knock him down with "strong drink." Mr. Peterson, however, may accept "Scalpel's" assurance that he was considered merely in his capacity of a writer. His letter was so at variance with his usual courtesy, that "Scalpel" was unwilling to consider it as his sole production, or that its contents had not been previously approved of.

When I run over the many gigantic remains of Mr. Watt's genius, which I saw in operation a little while back in the mining districts of Cornwall, and the important increase in power, which an additional effective vacuum of 3½ inches would ensure, when spread over the large areas of those pistons, you will, perhaps, Sir, deem an inquiry into the best means of obtaining the most efficient vacuum, and of testing its value, of sufficient importance to be entitled to further discussion. The large sum of money, too, invested in steam navigation—between three and four millions—and the rapid revolution it is making in the old system of navigation, give all classes connected with the steam-engine no little interest in the subject.

No writer on the steam-engine has, I believe, pointed out with the precision it deserves, the connection which the condensation of the steam has had with its rise and progress.* No part of this stupendous machine has undergone more changes or been the subject of more experiment. In proportion as it was more or less perfect, the usefulness of the steam-engine progressed. Papin was probably the first to suggest a vacuum, by the *cooling* of the steam by withdrawing the fire, and the mere operation of the atmosphere. Savery, about the year 1698, was the first actually to *condense* it by a jet of water playing upon his egg-shaped receivers. This he altered to an injection, and though he found it superior, yet strange to say, when he joined Newcomen they again had recourse to surface condensation by circulating water between the cylinder and its jacket. Nature, however, as in other instances, seemed determined to have her way. Accuracy in boring cylinders was, in that age of the steam-engine, unattainable. Water, as the best material to adapt itself to the inequalities of the cylinder was the substitute for packing, and covered the piston. On one occasion, sprays of this water made their way through the holes of an imperfect piston, and condensed the steam so much quicker, that to the surprise of the workmen, and it must have been considerable, the piston seemed bewitched, travelling with unaccustomed rapidity. The cause was discovered, and, like one of the most beautiful orders of architecture, the accidental hint of Nature was adopted. This was about 1704. Again was it discontinued, and we find even Mr. Watt, who in 1765 by his separate condenser and other inventions, turned this toy of the philosopher into the engine of the giant, persevering with surface condensation. He increased his surface until he found not merely that it was inconvenient for large engines, but that power was lost by the slowness of the process. After making many experiments he adopted the injection, which, in his own simple, but forcible language, "operated even beyond *his* ideas in point of quickness and perfection." Up to this period the superiority of the injection was unsettled; but excepting Cartwright, who patented surface condensation to use alcohol, it has from that time passed unnoticed for 65 years, until revived by Mr. Hall in 1831. This, I believe, is briefly the history of condensation through nearly two centuries.

We now return to the simple question in dispute, whether, as Mr. Hall does obtain 30½ inches vacuum (the fact has not been denied), "the great increase of power derived from the use of the patent condensers is therefore self-evident."

It seems to me that "Another Pioneer" has in nearly every point taken an erroneous view of my former paper. It always appeared to me, that carried away by results never before obtained, every advocate of the superiority of Mr. Hall's plan had forgotten the means in the end, and had with singular precipitancy omitted all consideration of the proper tests of its real value. But however satisfied on the point as an individual, I should not have opened a public discussion on its merits, and have only accepted a challenge when thrown out in a very useful journal.

The "test of power hitherto held to be unobjectionable" has never been considered a mere barometer vacuum, as your correspondent will observe. It could never have been so, for the valves or other parts might be disarranged, and if only half the steam at each stroke entered the cylinder or condenser, a more perfect vacuum than usual would be indicated, yet the power of the engine would be greatly diminished. Here Mr. Watt gave another instance of the strength of that intellect which anticipated every difficulty only to provide a remedy. With almost an intuitive perception he saw how greatly he might be deceived by so fallacious a test; and to satisfy himself that

* M. Arago's eloquent Life of Watt must be followed with caution when treating on this point.

his engines were actually performing the duty indicated by the vacuum, he found it necessary to ascertain what was going on in the cylinder, and invented the indicator for the purpose. I leave it then to the good sense of your readers to determine, whether the government engineers, Mr. Lloyd and Mr. Kingston, or the respectable firm of Messrs. Seaward exercised that caution expected from their station, when they gave the weight of their names in favour of so expensive an invention, without very accurately satisfying themselves upon this most material point. The former merely say "the power of the engine is not in our opinion diminished;" the latter, "I had no apparatus with me for ascertaining the actual power to which they (the engines) were severally working." In the former part of the last highly favourable certificate, it is observed, "the mercury in the vacuum gauge was steadily suspended at 29½ inches above its level, a perfection seldom or never obtained in the ordinary engine." It will now be clear to "Another Pioneer" that a mere barometer vacuum is not alone "a test of the actual power, hitherto held to be unobjectionable." Every science has assuredly its difficulties, but I do not consider that in the nineteenth century our knowledge of the laws of steam is limited. I cannot help thinking, indeed, that Dr. Black, Mr. Watt, and Professor Robinson, the last of which glorious trio a Watt pronounced to have "the clearest head, and the most science of anybody he had known," pretty well exhausted inquiries into the nature and laws of steam. More accurate experiments may have been made since their time, but such, I think, will not be found at variance with their discoveries, or at least with the principles they laid down. Now "the generally received opinion on the subject" is certainly contrary to your correspondent's. It is, that steam cannot be reduced so instantaneously into water, whatever "the extent of surface and of cold water employed," as by a properly directed injection. I have never rejected the fact of a vacuum of 30½, but simply considered that it proves nothing, for that taken where it is, so much further from the cylinder than in injection engines, it is not a self-evident test of increase of power. I complain that the usual and most accurate tests of the effective power have not been given in any one of the numerous certificates, and that in consequence the public, at a very considerable loss, have been led away by great names to give encouragement to an invention, the merits of which have been too hastily admitted, and its efficiency tested by an inconclusive criterion. The parrot cry of a vacuum of 30½ has been caught up as if that alone determined the superiority of surface condensation, and by repetition it has well nigh been classed as an undisputed truth.

"Pioneer's" observations respecting what Mr. Hall obtained by his experiment, and what Mr. Watt obtains by his, can have no application to the question,—the fact not being disputed—until it is proved that the superior vacuum of the latter gives the great increase of power insisted on. In the absence of the required tests, therefore, it is quite a fair argument to adduce the authority of the founder of the modern steam-engine, and such an authority! that "after trying several kinds," he found an injection vacuum superior "in point of quickness and perfection;" also that having tried both, if an efficient vacuum at 30½ was to be obtained by surface, without more than counterbalancing disadvantages, Mr. Watt would have obtained it.

Though steam navigation did not exist, it can hardly be seriously contended that Mr. Watt "had no particular inducement to ascertain whether he could, by any contrivance, condense as effectually by surface as by injection," if he could obtain a considerable increase of power thereby, which is the point in dispute. His whole fortune depended upon the saving of fuel, and the duty performed by its consumption. The last he guaranteed. If then an additional pressure of a pound and a half upon every square inch of the pistons of the large engines he began to make, could be obtained by surface condensation, as no injection water would have to be lifted out of a vacuum, he would have gained an important increase of power with the same consumption of fuel. For instance, it would give to Austen's celebrated engine at Towey Consols (80 inches diameter, stroke 9 feet 3 inches, 15 down strokes a minute,) and the one at the Great Consols (90 inches 10 feet stroke, 14 down strokes a minute*), an additional power of thirty-two and forty-one horses each. Nothing indeed connected with the steam-engine was more studied by Mr. Watt than the best means of obtaining the best, that is, the most efficient vacuum. It was too inseparably connected with his grandest conception, the separate condenser. He was long puzzled by the surprising quantity of water required to condense the steam, until he elicited, or Dr. Black explained to him, the theory of latent heat. Mr. Watt then determined the necessary quantity, and I cannot think he could have been ignorant of the mode of applying it for surface condensation, or of the superiority which, I

* I am not quite sure of this stroke.

admit, would attach to this plan, unless accompanied by a tediousness in operation and complexity of machinery which would give to it two fatal objections. His grasp of intellect was too prodigious, and only equalled by his patient and indomitable perseverance in its application, to allow me to doubt it.

The evaporation of about a gallon of water is required to supply the cylinder of a single engine of 250 horses power for each ascent or descent of the piston. This will occupy at 212° a space capable of holding 1,700 gallons of water, and be then equal to atmospheric pressure. At the pressure used in the *Queen*, taking the mean at 5 lbs., it will occupy a space capable of holding 8,500 gallons, and still be equal to atmospheric pressure. Such space the steam, I think, ought to come in contact with on the instant, to be condensed as rapidly as by injection. But the mere top of the condenser presents no such space. Although, therefore, steam flies with great rapidity to cold surfaces, it cannot be brought as instantaneously in contact with this great surface as by being broken up into the minutest particles by a volume of water, each separate globule of which is itself a separate condenser. Assuming the data of "Pioneer" the area of 700 inches is not one undivided space, but composed of 3,500 tubes; the power therefore required to drive the steam through them at 1,400 feet a minute must be something on account of friction, take time, and be deducted from the power. If, then, the steam were annihilated at top as instantaneously as it ought to be to offer no resistance to the immediate reversal of the piston, it would be unnecessary to have the tubes nine feet long. But the moment the steam touches the top of the condensers they will be raised to a very high temperature, and be less capable of condensing the remaining portion with equal celerity; for the water surrounding the tubes cannot with such pumps be changed with the same rapidity as the injection water is removed, or rather cut off from its condenser by the closing of the valves of the air-pump bucket. This steam must consequently remain at top until the first portion is condensed, and though the time may be short, as I before remarked, "a very trifling difference in time makes a very great difference in the available power." That the condensement must be reduced to a lower temperature after so small a quantity has trickled down so many thousand pipes than it can be in injection engines, is clear. This accounts, by so much more heat being abstracted from it, for a more perfect vacuum than in injection engines, as well as for a better vacuum at the bottom of such condensers, where they are always considerably colder than at the part nearest to the pistons, to which the hot water will ascend, to flow out as it absorbs the caloric of the steam. It is no uncommon occurrence for instance, when a still is set to work, to find a vacuum at the bottom of the worm whilst the steam is pouring in—evidence that a vacuum may exist at one part with the usual pressure at the top. Even in injection engines I doubt if the steam is wholly annihilated before the piston reverses its action, much less when the steam has to seek so great an extent of cold surface.

No part of my former paper must be taken except in connection with the spirit of the whole. After the air has been expelled, a vacuum is the result of the condensation of the steam by the abstraction of its heat. Savery and Newcomen obtained their vacuum without the air-pump. Mr. Watt first employed it, but a more perfect vacuum succeeds when the air pump lifts, and the disengaged air, condensement and vapour arising from it, the (last somewhat dense *in vacuo*,) are withdrawn. If, for instance, the condenser of an injection engine hold 70 gallons, and the injection and condensement make 51 gallons at each discharge of steam, there is a better vacuum when the air pump has emptied the condenser than when that is two-thirds full. I quite dissent, for the reasons given above, from the observation that "the fact of a vacuum of 30½ being *actually obtained* demonstrates that steam may be condensed *as rapidly* by surface as by injection." A more perfect vacuum must necessarily be obtained by surface, but not in the same time throughout the whole space, and time is power in the steam-engine. For similar reasons I think that 27 vacuum by injection will give more real power than a vacuum of 30½ by surface. It will be seen by the context that I did not mean to double the 15 horses power for working the force pumps, so called, because in overcoming the friction of 3,500 tubes they must force the water. I think that at least 5,000 gallons per minute instead of 4,000, stated in my last, would be required to keep the tubes sufficiently cool, and that "about 15 horses power," as stated, would be necessary to do it effectually.

Immediately the air pump begins to lift, the condensement and injection water rush under its bucket, so that "Pioneer" is not quite correct in saying "there is no counterbalancing pressure on the under side of the bucket of the air pump." This counterbalancing pressure will operate until the water has found a sufficient space to be at rest in, when the air by expansion will still, to a degree, continue it. If, indeed, it were

as your correspondent asserts, and "a vacuum" were continued "on the under side of the buckets," he should then deduct from a 500 horse power injection engine about 58 horses instead of 9. If we take the vacuum at 27° he will observe that immediately the discharge valve is opened to the hot well, say at one-third of the stroke, an atmospheric pressure of 13½ lbs., which "Pioneer" seems to have forgotten, is, by the law of fluid pressure, suddenly thrown upon every square inch of the air pump bucket. This in the *Queen* is 43½ inches,* and if there were "no counterbalancing pressure" would have to lift against just so much dead weight. The weight of water must also be added, which I have omitted. I have not time to consider what power is gained by surface condensation owing to the discharge valve not being opened until nearly the top of the stroke, an increase which seems never to have been considered. In estimating the expense for the *British Queen's* condensers I may be "in error," but including the loss for detention, as stated in my last, patent right and manufacturer's charges, I believe I did not overrate it.

The comparison of the chronometer and wooden clock is not a happy one, since whilst the former acts with infinitely greater precision, it possesses, if I may judge by my own, at least an equal capacity of endurance. No such superiority attaches to surface condensation; its complexity and liability to derangement in comparison with injection are indisputable. Objections, however, to powerful machinery on the score of complexity, will be found more valid the more they are considered and applied. I could furnish many illustrations. There is a unity of design and a simplicity which pervade all nature and all great mechanical inventions, which render complexity a fatal objection at *the outset*. Wanting the power of perpetuity they want one of the chief criterions of excellence. The utmost efficiency is seldom or never attainable but by the utmost simplicity the particular invention is capable of, for simplicity and efficiency are the only sure characteristics of perfection. It may perhaps be considered an axiom in mechanics, that however completely a complicated invention may for a time appear to perform, either something will start up to prove it altogether worthless, or if the end is indispensable a subsequent inventor will simplify the means.

Allow me to observe that when I wrote my first paper I formed my opinion solely upon the authority of Mr. Watt and the nature of steam. Taking the hint from Mr. Peterson's admission, that the condensers elsewhere did not always produce the same successful results, I have since inquired how far my theory was correct by the actual working of Mr. Hall's system, of which before I was ignorant. I find that after a vast expense and every trial, by those naturally unwilling to be convinced, that they had thrown away so many thousand pounds upon an imperfect invention, the condensers have been removed from the following vessels, three of which belong, I believe, to the Saint George's Company, and probably form part of the 2,000 horses power referred to by "Tomahawk"—the *Sea Horse*, *Juno*, *Vulture*, *Adelaide*, *Albatross*, *City of London*. In the last vessel I question if they had a fair trial. If I am correctly informed the condensers will also be removed from the *Sirius*, *Hercules*, and *Tiger*, as soon as they can be spared from their stations. To the *President* I do not believe they will be applied.

But there will be found, I doubt not, one other objection not less serious. I have not sufficient acquaintance with chemistry to state positively whether the boilers, though saved from incrustation by this plan, will not in reality be destroyed nearly as fast, by the impregnation of copper conveyed in the water to the iron of the boilers. The steam impinges with a force of 18 or 19 lbs. thirty times a minute on 7,000 copper tubes, and must rapidly sweep off all oxidation. If so, the effect cannot but be injurious to a serious degree. The settlement of this suggestion will at least be useful to experimentalists.

If now I have stated facts, and they are easily contradicted, it is not on Messrs. Beale, Pim and Twigg that blame can fairly be laid for incurring the great outlay. Directors must necessarily depend upon the professional attainments of others, and who would not be anxious to procure to a Company, the many advantages and great saving pointed out in a book full of certificates from persons considered competent to give them? "This is a sad day for science and scientific men," was observed by Lord Chief Justice Dallas on a similar occasion, and the frequent recurrence of such failures cannot but have a serious effect on every new invention. In what way can inventions be introduced when the certificates which support them fail to obtain confidence? The poor inventor may in vain pay his three or five guineas for professional opinions; the capitalist will cease to value them or to invest his money where experience has taught him there is no security.

Except for the word "misrepresentation," which I am willing to believe has escaped

* Stroke 3 feet 11—18 per minute.

"Tomahawk" in his excitement, I should deem unnecessary any notice of his labours. But the charge is too grave to pass without observation. The engines of the *India* will be found arranged as I have described—a solitary instance, I hope, of eccentric originality. The first row of condensing pipes in the *Queen* is about 6 feet 5¼ inches from the air-pump, and the condensers being twelve feet high, the condensement must pass through a space sufficient to confirm the effect of my assertion of "the air-pump being some fifteen feet from the piston." If the condenser were divided from the cylinder by only a foot, and the tubes were fifteen feet high, the air-pump would still be, as regards its effective operation, fifteen feet from the piston. "Scalpel" was not ignorant that the Cornish engines, with the same consumption of fuel, perform three times the duty that Mr. Watt obtained. He knew that Austen's engine had lifted the surprising weight of over 125 millions of pounds one foot high, by one bushel of coals, at the cost of eight-pence; it was performing 80 millions of pounds when "Scalpel" saw it.* Yet "Tomahawk" will find, I think, that few, if any, improvements have been made in Cornish engines, that did not originate with Mr. Watt; certainly they are upon his plan, in every important point, in principle especially, and it was the alteration of the principle I spoke of. My previous paper was, doubtless, prolix; it is necessary, at times, to put the same thing in different lights, to obtain attention, and ensure conviction. Though it was written with too much haste, as is evident, and the sentences misplaced in copying, I believe "the labour of writing" it, has not been lost. In reply to it, "Tomahawk" has not favoured us with a single observation to the point. We find only "a forest of words, over a dessert of ideas."† The little object of verbal criticism, and transposition of sentences, to convey a meaning never intended, is unworthy of any writer in the *Mechanics' Magazine*. None but "Tomahawk" could be so little able to comprehend the tendency of my remark, as to charge me with such shocking ignorance in regard to Newton's prediction. I could not mean that the purest carbon, the base of the diamond, was the same as hydrogen gas, the base of water. I sought to establish, by a remarkable illustration, the correctness of deductions of the exact sciences, and the power of predicting thereby the result of experiments. The instances on record are numerous. Newton observed that all bodies that refracted light, were heat-giving bodies, and possessed the same base or property—inflammability. From this fact he ventured a prediction, as prescient in itself as Seneca's prediction of another world, and Professor Kant's of a sideral appearance, that when means were discovered to fuse the diamond, and decompose water, these bodies would also be found to have an inflammable base. Prior to experience, and independent of the knowledge of the unity and simplicity of nature's laws, no assertion could appear more bold, or less likely to be so verified. Diamond, the hardest substance—water, the softest, and the great antagonist of fire—both so opposite yet alike! Mr. Watt, in 1783,* first discovered the composition of the latter. "Tomahawk" having thus mercifully sought "to throw dust in my eyes," the better to brain me with his weapon, let me suggest to him the fate of Milo, and not again to attempt a task beyond his strength, nor to choose an instrument he is incapable of using. It will more fatigue him than hurt his foes, and but leave him open to the knife of his antagonist, since he wields it neither with the polished dexterity of practice, nor the native strength of the savage.

The discussion of this question cannot but be useful. If it be true, as observed by Lord Brougham, that nothing is so firmly established (if it will *bear* it, I suppose, his lordship means) as what is "well picked to pieces," you cannot, Sir, but receive the thanks of the public for the admission of my letters, or the gratitude of Mr. Hall. If this invention, confirmed in its importance by the numerous genuine certificates of persons in authority, and of which I have given Mr. Hall every credit, will not support the discussion of a mere anonymous writer, provoked by Mr. Peterson's challenge (not, let it be borne in mind, originating with "Scalpel"), the former will owe you some obligations. If by an increased demand for these "improvements," it should be proved, to use Mr. Peterson's words, "these remarks *must* be the result of prejudice, interest, or ignorance, coupled with that jealousy which all little minds feel towards all those whom they know to be their superiors," and that

* More than two millions of pounds sterling have been saved in fuel to the proprietors of the Cornish mines, since 1814, comparing the annual consumption of fuel, for an equal number of horses, previous to that period. The causes cannot be explained here.

† It would be unfair, however, to "Tomahawk," not to distinguish the single original idea in his paper, or to give him all the benefit of the brilliant discovery—the happy classification of Mr. Hall among the doves, "Columbis" (see the quotation). But for so high authority we might have been sorely puzzled to find the resemblance. It is hoped, for the benefit of Ornithological science, that "Tomahawk" will send a feather, of so rare a species, to Audubon and Waterton, for their next editions.

* It is now clearly established that this great man, and not Cavendish, is entitled to the honour.

the invention thus discreetly advocated, is only more firmly established in public confidence, then must Mr. Hall admit that you have done him much service.

In conclusion, I beg to thank you for directing attention, by your note, to the sobriety of style, alone suited to inquiries of this nature, and to request your indulgence to be allowed, on my return, to correct any errors of memory. The replies to my paper were forwarded to me where I am writing this, away from my own works of reference, which I cannot supply βάρβαρος μῖτα βάρβαρως·

I am, Sir,

Your very obedient servant,

SCALPEL.

23d June, 1840.

Postscript.—I may be in time perhaps to add, by way of postscript, a word or two in reply to "S." in your last number, for both "S." and your other correspondents seem to have mistaken my meaning though sufficiently expressed. As a general observation upon the value of authority I may observe that I am as little inclined as most men to consider authority conclusive. No error has more fettered the human mind or thrown a darker cloud over the progress of knowledge. The world, old in years, is yet in the infancy of science, though rocked and nursed by the intellect of centuries. A blind deference to "the great of old" is the cause, and until Bacon taught men to think, except a few brilliant examples, mankind received without examination, the hypotheses of antiquity. The "*hypotheses non fingo*" of this great mind, broke through the hitherto impenetrable barrier of ages, and dispersed the masses of error which superstition and laziness of thought had accumulated. To refuse a fact, simply because it is opposed to the generally received opinion, or to the authority of a great name, is not alone illogical and unphilosophical, but childish. But then, it must be a true fact. Great names, like great bodies, should be used with caution, for too frequently, when set in motion they carry everything before them, merely by their momentum. Like great orators they are equally dangerous, for they hoodwink our judgments to put the halter round our necks. But let us be still more cautious how we admit false facts, for a long experience has taught us, that these are still more prejudicial to the spread of sound knowledge, for there is no lie so successful as that based upon a *little* truth. "Nothing," says Velpeau, "can lie like a fact. From the time of Hippocrates to the present, facts seem to wish to deceive all mankind." Now the invention in question has been based upon such false facts, for during the ten years it has been before the public no correct test of its "great increase of power" has been made known. Authority with proper restrictions has always been admitted. In the whole history of the sciences I question whether an appeal to authority can be found of greater, if of equal value, than the testimony of Mr. Watt on the particular point in question. The case I think is without parallel. It becomes therefore not only a fair argument, but the only warning against, or corrector of the further reception of those "false facts" which, as Bacon observes, "if once set on foot," what through neglect of examination, the countenance of antiquity, and the use made of them in discourse are scarce ever eradicated." I trust, therefore, these observations may induce a more complete and cautious examination of inventions, and that no man of science will in future give certificates without great certainty that his facts are not of this description. The credit given by "S." to Hall for his success, enhanced by Watt's previous failure, whether the results prove the correctness of Watt's statements or *the reverse* carries with this positive and presumptuous assertion of *Watt's failure* such a contradiction of ideas, as to require nothing further than to point it out. We are next assured confidentially that the "good fortune was quite as remarkable as the talents which have placed Watt in the foremost rank" (indisputably the *first*) "of inventors." Mr. Watt's efforts were one continual contention against bad fortune, which nothing but the most persevering exertions, and an unexampled combination of talents rarely united, could overcome. He was obliged to sacrifice two-thirds of his mine of wealth to secure the smaller share. He was involved for eight years with the creditors of Dr. Roebuck before he could make it available. The extension of his patent was then opposed by nearly all the talent of the most talented House of Commons in the annals of Parliament, and Watt was almost worn down by the anxiety of the opposition, and the fatigue of overcoming it. When obtained, for seven long years was he again involved in a most unjust litigation with the Cornish miners, subject to the many vexatious and irritating annoyances which such an opposition would render doubly galling to a man of genius. He became a lawyer in consequence and learned a new profession—cheated by pirates, and beset by plagiarists, the veriest Tittlebat Titmouses of intellect in comparison. These are the instances of "good fortune *quite as remarkable* as those talents" which have changed the commerce of the globe and given a new feature to the physical and moral world. Had Mr. Watt been able to devote those 13 years solely to

his own profession or to other researches, what might we not have had from the undisturbed exercise of the maturity of a mind never surpassed.

Mr. Watt has with the modesty of genius sufficiently admitted the advantages of his connection with Mr. Boulton to leave his admirers unmindful of them.

Smeaton, though a great engineer, made too many mistakes respecting Watt's engines to leave Watt indebted to him for any aid of the least importance to the success of his inventions. Smeaton's air pump I am unacquainted with, but it could scarcely be essential to the practical commercial success of the engine, since the air pump of the steam-engine is little more than the common pump known to Galileo. To Wilkinson for his correctness in boring the cylinders Mr. Watt was probably more indebted than to any other. But if that fair "probability" which the author of the analogy has so happily declared "is the guide of life," may be here applied, we may fairly "speculate" that he who so well showed the erroneous opinion of Smeaton by creating and causing to rise around him the mechanical ingenuity necessary to manufacture his inventions with sufficient perfection would surely have also invented a boring machine of equal accuracy. No man, in fact, owed less to others, or to lucky flashes of thought than Mr. Watt. Unlike the chance suggested principle of gravitation of Newton and other accidental discoveries, all Mr. Watt produced was by patient and laborious cultivation. The public will not then readily believe the mistaken dicta of Mr. Watt and his correction by Trevithick upon the loose authority of "S." since Trevithick, it is well known, applied to his carriages Mr. Watt's principle of high pressure steam as patented by him, and the expansion of steam now used in Cornwall is also the invention of, Mr. Watt.

The unanimous decision of four judges, (Lord Kenyon the Chief) after the case, on account of its novelty and importance, had been argued twice, can hardly be attributed to Mr. Watt's good fortune not having deserted him. Parties who with a miserable feeling of detraction and selfishness had made common purse and cause to throw off their homage to the genius of Mr. Watt in the annual tribute of many thousand pounds after he had saved them from comparative ruin by enabling their mines to be lucratively worked—these were not the persons likely to submit to an "illegal" decision. The privilege of openly discussing the decision of the judges is doubtless one of the most valuable securities for our liberties; yet it ought to be exercised with respect and caution. We, therefore, who have not the whole case before us, are not qualified to decide that such decision was illegal, although "admitted even by the *Edinburgh Review*." This Journal has committed too many grave errors to render it infallible, especially where in the article referred to we are instructed that "the true inventor of the steam-engine was Savery," though his engine was not worked even on the principle of Mr. Watt. It had neither steam cylinder, piston beam, parallel motion, nor separate condenser, in fact, not a single feature by which we could discover, by the minutest examination that the present had at any one time any thing in common with Savery's. Yet the article is in other respects a good one; I speak however from recollection, only the writer has a proper reverence for the surpassing talents of Mr. Watt, and declares himself to be "almost the worshipper of his genius." It may indeed be more properly applied to Mr. Watt than to any other the epitaph,

"*Si monumentum requiris circumspice.*"

Mr. Hall's System of Condensation.

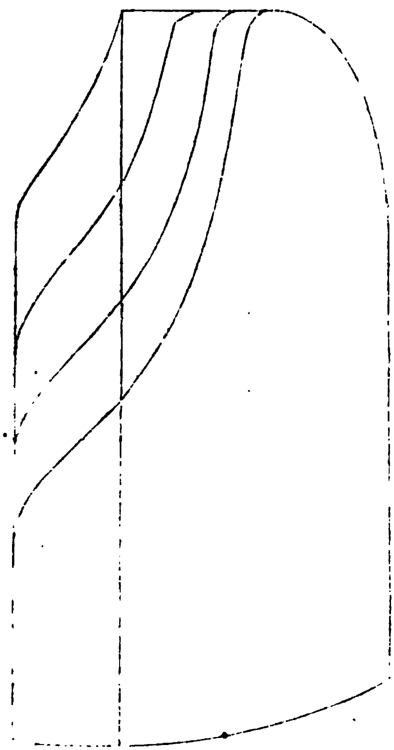
Sir,—As I am led by the note in your Magazine of the 20th inst., to suppose that you will do justice to both sides of the question respecting the merit of Mr. S. Hall's condensers, and as the very superior way they are working on board the *British Queen* is exciting very great interest in the engineering world, I trust you will find room for some information and observations with which I now trouble you.

I should have made some remarks upon the ungentlemanlike style and language of "Scalpel," as being exceedingly improper to be used among scientific men, and have refuted many of his statements, but the excellent papers of "Tomahawk," and "Another Pioneer" on the march of truth, in your 880th No., together with the gentle censure bestowed by the latter on "Scalpel's" style, render any further notice of him, or his statements, unnecessary. You would not, therefore, have been troubled with this communication, had not the paper signed "S." appeared in your last week's Magazine.*

As "S." evidently wishes fairly to elicit the truth as to the comparative merits of Mr. Samuel Hall's condensers, and the common condensers, and as the experiments h- suggests are not easily made, I would pointe

* It is exceedingly silly in any one to suppose that a writer of "Scalpel's" powers is to be so cavalierly disposed of. We have not observed any thing either in his "style or language," which can at all justify the aspersion here cast upon them; though the truth to speak, we have observed in his communications a knowledge of the subject handled by him, and a vigour in the handling it, which the best of his antagonists have not yet by any means rivalled. Our

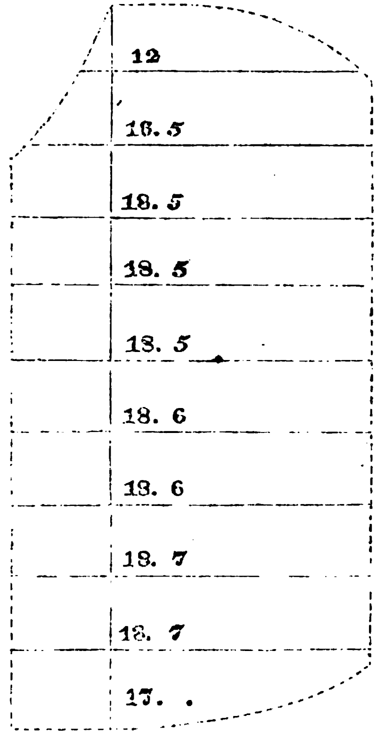
out the experiments which actually have been made on board the *British Queen*, and which may, at any time, be repeated. These experiments have been made by the application of an indicator to the steam cylinder, which, I doubt not, "S." will consider the most infallible test of the efficient quality of the vacuum. As so much has been said by "Scalpel" and others of the possibility of Mr. Hall's condensers producing and showing a very superior vacuum by the application of the mercurial gauge at the place where, in common engines, it is usually applied, viz., to the condenser, without producing a corresponding superior vacuum in the working cylinder, I beg to inclose you two diagrams, one produced on the 2d September, 1839, and the other on the 14th of April last, by the application of the indicator to the cylinders of the *British Queen*.



"Taken Monday, 2d September, 1839, at 12 noon. Vacuum in condensers, $30\frac{1}{2}$ inches, pressure in boilers, 7 lbs.

"Strong head wind, with a heavy sea.

"E. PETERSON."



Average . . $10)\ \dfrac{1756}{17.56}$ pressure.

"Taken Tuesday, 14th April, 1840. Vacuum, $30\frac{1}{2}$ inches, steam, $6\frac{1}{2}$ lbs., knots, 19. Expansion tried on $\frac{2}{8}$, $\frac{4}{8}$, and $\frac{6}{8}$. Squally and rainy from the N.N.E. No sail. 13 days out. E. PETERSON."

If these diagrams (which can be vouched for by several persons) be correct, are they not the most conclusive answers to all "Scalpel's" *twaddle* (to use one of his favourite phrases) about the "slowness of the process" of the steam passing from the cylinders to Mr. Hall's condensers, and to his

present correspondent writes too much in the *Peterson* vein. Every one who has any thing to say (no matter how little to the purpose) in favour of Mr. Hall's system of condensation, is "forsooth, one who evidently wishes fairly to elicit the truth," while, on the contrary, every questioner of its merits, however sincere, is stigmatized as little-minded, prejudiced, self-interested, &c. Such a mode of dealing with a grave subject as this assuredly is, will never go down with the thinking and judicious portion of the public.—Ed. M. M.

"*wonde r* (speaking of the vacuum of the latter) 'how the —— it got there?" I would here mention a fact of which "Scalpel" does not appear to be aware, viz., that the pipe by which the vacuum gauge is attached to the engines of the *British Queen*, has two branches furnished with cocks, one leading to the lower chamber of the condenser, and, of course, below the condensing pipes, and the other to the chamber into which the steam immediately enters as it leaves the working cylinder. By this means the vacuum in each chamber is ascertained, and the result is, that in the upper chamber it is not more than ⅛th inch lower than in the bottom chamber. There is, however, a little more undulation in the mercury when the barometer is attached to the latter. Is not the fact shown by the indicator, of the superior vacuum produced in the cylinders by Mr. Hall's condenser, as well as in the condensers themselves, confirmed by the performance of the engines, and the late excellent voyages of the *British Queen* to and from New York?

As I am convinced that every voyage of the *British Queen*, and of every other vessel to which Mr. Hall's condensers are applied, will more and more confirm their importance and perfection, I shall only point out one circumstance which should always be taken into consideration when a comparison is made between the performances of the "*Great Western*" and the "*British Queen*." The engines of the latter have to propel *one-third* more tonnage, per horse-power, than the former. Notwithstanding which, the last voyage of the *British Queen* is the shortest on record.

I may now make a remark or two on what "Scalpel" says respecting the attempts or failures of Mr. Watt, and the successful apparatus which Mr. Hall has invented. It is notorious that Mr. Watt stated that it was impossible to obtain a sufficient vacuum by external condensation, to work steam-engines, "even though they had pipes sufficient to cross the Thames." These, I believe, were his own words. Now, although it will be termed high treason in me to say so much, it is my opinion that Mr. Watt did not see (as Mr. Hall did) the science of the matter, viz., that it was not only necessary to condense the steam, *but that it was also necessary to cool the water resulting from its condensation, to so low a degree of temperature as not to afford a vapour of sufficient elasticity to injure, if not altogether destroy, the vacuum.* Thus Mr. Watt never obtained an effective vacuum, owing, no doubt, to his not having been aware of the extent of cooling surface necessary to produce the required effect. Mr. Hall (who has assured me that he was not acquainted, previously to his taking out his patents, with the attempts made by Mr. Watt) perceiving the necessity of obtaining the above-mentioned extent of cooling the water resulting from the condensed steam, has perfectly succeeded in attaining all that he aimed at; and I am free to confess that I am of the same opinion as "S.," that great credit is due to Mr. Hall for his invention, and that "that credit is much enhanced by Mr. Watt's previous failure."

When Mr. Hall's attempt at condensation by surface was generally known, it was ridiculed as a visionary attempt by many scientific men, some of whom (who were friendly to him) lamented that he should have entertained such erroneous ideas, and devoted his time to effect an impossibility. Many of these parties when they now see the actual vacuum he obtains in large marine engines, are free to admit that he has perfectly succeeded, and are become admirers and staunch advocates of his beautiful invention. I would ask what can be stronger presumptive proof of its being considered an original and important invention by the scientific world, than the fact, that upwards of thirty of the largest manufacturers of marine and land engines in the United Kingdom, applied for and executed deeds of license from the patentee to allow them to manufacture his condensers, and gave the strongest testimonials of their excellent performances?

In conclusion, I will say, that although the unfair opposition which Mr. Hall meets with, in certain quarters, may deprive him of the just reward of his labours, it can never prevent the ultimate universal adoption of his condensers, nor lessen the reputation he has justly acquired from his invention and introduction of them.

I am, Sir,
Your most obedient servant,
JAMES OLDHAM,
Civil Engineer, Hull.

No. 7, King Street, Cheapside, June 29, 1840.

CLEGG'S PATENT ATMOSPHERIC RAILWAY.

The immense advantages that seemed to be offered by the well-known and wonderful properties of common air—the most powerful and universal mechanical agent within the reach of man—long since led to suggestions for making this power available for various useful purposes. So long ago as the latter end of the 18th century, Papin, the discoverer of high-pressure steam, and inventor of the "Digester," which bears his name,

suggested the transference of power to a distance, by the rarefaction of air in pipes, by means of suitable machinery. His experiments, however, were unsuccessful.

In the year 1810 Mr. Medhurst, engineer, of Denmark-street, Soho, published an account of "A new method of conveying goods and letters by air," followed in 1812 by "some calculations and remarks tending to prove the practicability of the scheme." "These publications," says Mr. Medhurst, "met with that indifference and contempt, which usually attend all attempts to deviate so widely from established customs." Nothing daunted, however, in 1827 Mr. Medhurst published a tract of 34 pages, entitled "A new system of inland conveyance for goods and passengers." In this work Mr. Medhurst sets forth two plans, the one consisting of a canal 6 feet high and 5 feet wide, within which suitable carriages were proposed to be propelled upon stone or iron railways, by alternately injecting or exhausting air. A second plan consisted in employing a small tube, within which a piston was made to traverse, communicating in an air-tight manner through the tube, with the carriages placed externally upon a pair of rails, between which the air-tube was laid. A third modification consisted in employing the large canal for the transmission of goods, and also communicating the moving power to carriages for the conveyance of passengers placed externally above.

In 1824 a patent was taken out by Mr. Vallance for a mode of employing atmospheric pressure for locomotion. Like Mr. Medhurst, he proposed to form an air-tight tunnel the whole length of the railway, and large enough for the train of carriages to travel inside it. The tunnel being provided with an air-pump, and exhausted on one side, the pressure of the atmosphere acting upon a piston attached to the foremost carriage, was expected to propel the train forward. The impracticability of this plan must be apparent to all, as, independently of the immense expense of forming an air-tight tunnel of these dimensions for the whole length of the line, the inconvenience of travelling in it, for any long distance, would altogether preclude its use. In 1834 a Mr. Pinkus attempted to obviate these defects, by adopting Mr. Medhurst's second plan of a smaller tunnel. He proposed to employ pipes like common gutter pipes, 40 inches in diameter; and he took out a patent for covering the lateral opening in these pipes with a rope. The covering of rope, he expected, would make the pipes air-tight enough, to allow a sufficient vacuum being obtained in the tunnel to draw a train of carriages on the outside. A second patent was taken out by Mr. Pinkus, in 1836, altering his system to a vacuum locomotive engine, and varying the covering of the lateral openings; but neither of these plans have been carried into execution, from its being found impossible to cover the lateral opening sufficiently air-tight. These difficulties have been at length surmounted by Mr. Clegg, who has succeeded in rendering the power of the atmosphere available for locomotion, with a degree of economy and perfection, even beyond his most sanguine expectations. We attended at Wormholt Scrubbs, on Monday last, to witness some trials, on an experimental line, half a mile long, which has been laid down by Messrs. Clegg and Samuda. The gradient is a rise of 1 in 120 about half way, and 1 in 115 for the remainder. A continuous line of cast-iron pipes, 9 inches in diameter, put together with deep socket joints, is laid between the rails; the inside of this pipe is not bored, but is lined with a coat of pressed tallow, $\frac{1}{10}$ of an inch thick, which lubricates and lessens the friction of the piston which traverses within the tube. There is an opening all along the upper surface of the pipe about $1\frac{1}{4}$ inch wide. This opening is closed by a valve extending the whole length of the line, formed of leather, riveted between two pieces of iron, the lower piece exactly filling the aperture, and making up the circle of the pipe, while the upper piece is wider than the opening, serving to prevent the external air from forcing the leather into the pipe, when a vacuum is formed within it. As the mode of constructing and closing this continuous valve, constitutes the chief peculiarity and most striking feature of Mr. Clegg's invention, we extract the following description of it from his specification:—

"My improvements consist in a method of constructing and working valves in combination with machinery. These valves work on a hinge of leather, or other flexible ma-

terial, which is practically air-tight, (similar to the valves commonly used in air pumps,) the extremity or edge of these valves is caused to fall into a trough containing a composition of bees-wax and tallow, or bees-wax and oil, or any substance or composition of substances which is solid at the temperature of the atmosphere, and becomes fluid when heated a few degrees above it. After the valve is closed, and its extremity is laying in the trough, the tallow is heated sufficiently to seal up or cement together the fracture round the edge or edges of the valve, which the previous opening of the valve had caused, and then the heat being removed, the tallow again becomes hard, and forms an air-tight joint or cement between the extremity of the valve and the trough; when it is requisite to open the valve, it is done by lifting it out of the tallow, with or without the application of heat, and the before-named process of sealing it, or rendering it air-tight, is repeated every time it is closed. This combination of valves, with machinery, is made in the application of these valves to railways, or other purposes by a line of partially exhausted pipes for the purposes of obtaining a direct tractive force to move weights, either on the railway or otherwise.

"This I effect by laying down a continuous length of pipe containing a lateral slit or opening its whole length; a piston is made to travel in this pipe, by exhausting or drawing out the air from the pipe on one side of the piston, and allowing free access to the atmosphere on the other side of it; an arm from this piston passes through the lateral opening to attach to the carriages on the railway, and draws them along with it. The whole of this lateral opening is covered by the valve before described, and that part of it, through which the arm passes is lifted to allow it to pass, and also for the admission of air to the piston, by means of an apparatus connected to the arm; the carriage to which this arm is attached, we call the driving carriage; to the hinder part of this carriage a long heater is attached, which is drawn along by it upon the tallow contained in the trough, and reseals the valve ready for the next train, which repeats the operations above described. At certain distances which are regulated by the nature of the road, steam engines and air pumps, or other apparatus are fixed for exhausting the pipes: and at a short distance beyond the connexion from the engine to the pipe, valves are placed closing the end of one length, or section of pipe, and the beginning of the next, between which, a space is left for stopping the trains if required; these valves also divide the pipe into suitable lengths to be exhausted by each apparatus, or close to the end, where it is not required to be continued, as on acclivities where the carriages will run by their own gravity, thus every section of pipe is enclosed at the two ends, by these valves, and is exhausted by its own steam engine and apparatus; these valves, which I call the separating valves, are opened by the driving carriage to allow the piston to pass, and are closed after the train has passed.

"If the trains are required to be started as frequently as possible, the engines are employed constantly exhausting the pipe, but if a longer period than is necessary to exhaust the pipe be required to elapse between starting the trains, the engines are employed in the interval to exhaust large vessels or receivers, which, when the train starts are opened to the pipe, to assist to obtain the vacuum therein, and to maintain it until the train has passed."

The construction of the valve will be rendered apparent, by reference to the accompanying engravings:—Figure 1. shows a section of the valve when closed, and figure 2, when opened. A A is a section of the cast-iron vacuum tube, B is the leather valve strengthened above and below with iron, and hermetically sealed by the composition C. D is a protecting cover, formed of thin plates of iron, in lengths of about 5 feet, hinged with leather, for protecting the valve from rain, snow, &c. The end of each plate underlaps the end of the next, in the direction of the piston's motion, thus insuring the lifting of each in succession.

In the present instance the air-pump used to exhaust the pipe is 37½ inches diameter, and 22½ inches stroke, worked by a 16-horse power condensing steam-engine. The vacuum was raised 18 inches of mercury, in 1½ to 2 minutes; two gauges were fixed at the two ends of the line, and no difference was perceptible in the time at which they indicated the same degree of vacuum.

We have now before us tabular results of the experiments made on the Birmingham, Bristol, and Thames Junction Line, on the 11th, 15th, and 29th insts. In several of these instances, the air-pump, making 42 strokes per minute, and the mercury standing at 18 inches, two carriages, with a gross load of 8 tons, was propelled at a speed of 22½ miles per hour. There were four experiments on the 29th instant; in two of them the velocity was 30 miles an hour—in one case 36, and in the other 40 miles per hour—

Fig. 1.

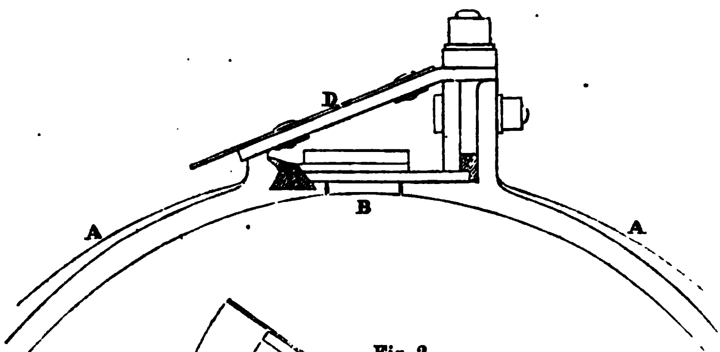
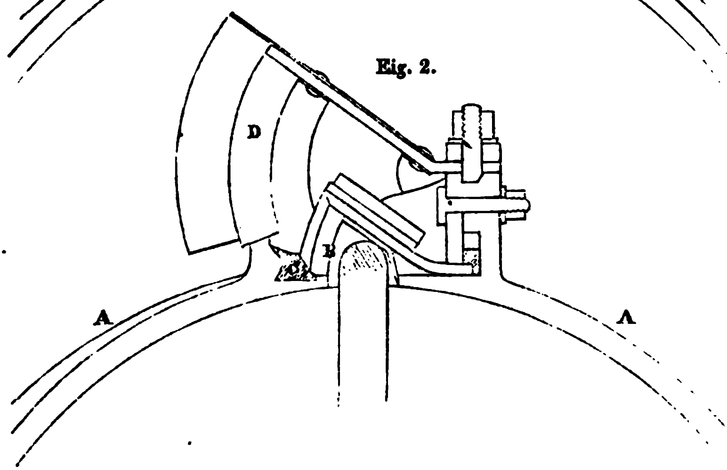


Fig. 2.



the loads carried being 8 ton 2 cwt., and 5 ton 13 cwt.

The maximum velocity is not obtained on this line, in consequence of the shortness of the distance; the tables show a constant, though not an uniform, accumulation of speed. The want of uniformity is attributed, 1stly, to the variation in the gradient from 1 in 120, to 1 in 115; and, 2ndly, to irregularity in the speed of the air-pump, as the boiler does not generate sufficient steam to supply the engine, and its speed is, consequently, diminishing towards the close of each trip.

Some of the most striking advantages claimed for this construction of railway, are the following:—

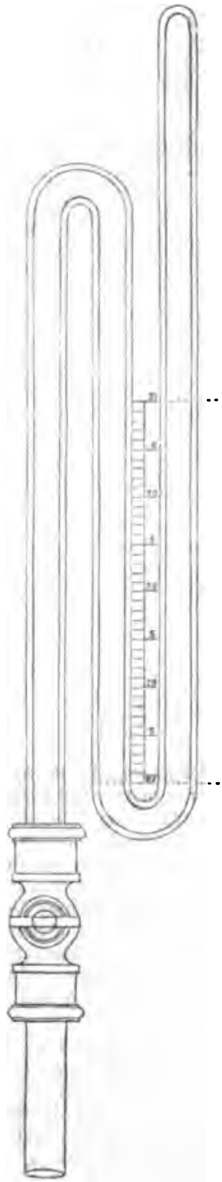
1st. In comparison with the locomotive-engine system, the entire absence of all unavailable weight.

2nd. In comparison with the stationary-engine system, the absence of the weight and friction of the rope; in lieu of this there is merely the friction of the piston, &c., travelling through the pipes.

3rd. As the speed of a train, upon this system, depends entirely on the velocity with which the air is removed from before the piston, any velocity may be obtained by increasing the power of the stationary engines; and as two trains can never receive power in the same section of pipe at one time, no collision can ever take place.

4th. From the increased facility of ascending steep gradients, a large saving is effected in the first cost of a road; but a more material saving is effected annually in working on this system, as the expense of fixed engines (of the power required) is very considerably less than the expense of locomotive power, and nearly the whole cost of maintaining the way is avoided.

SIMPLE AND ECONOMICAL BAROMETER.



Sir,—Having seen in your journal for May an engraving of an article, termed Bedwell's patent barometer, I beg leave to submit, to the notice of your readers an article invented by me about two years and a half ago, which is, doubtless, less expensive and more compact than the present one. Wishing to furnish a model of a steam-engine with a barometer, and one of the usual form being too cumbersome, I endeavoured to find a substitute, and this was the result of my labours. I obtained a glass pipe from Bristol, the cost of which was eight-pence, the cock about one shilling more; so a good barometer may be had for the sum of thirty-pence, while Mr. Bedwell's, probably, costs as many shillings, and I dont think is quite so effective as mine, in consequence of the unequal rate of the fall of the mercury, owing to the form of the bulb which receives it, thereby rendering necessary the graduation of the tube. By experiment mine is so simple, as to require no explanation. The dotted line shows the level of the mercury when at rest. It may have any range. Four inches is sufficient for any engine that ought to be working. Perhaps the scale should have an additional range of an inch or two upwards (say to 36!), for Messrs. Peterson, Hall & Co.

I remain, Sir,

Yours respectfully,

MOMUS.

Chacewater, June 6, 1840.

DAMPIER'S PATENT GEOMETRIC BALANCE.

If the public are not supplied at the present time with a perfect balance—one which shall relieve all posterity from any further care about the matter—it will not be either from any paucity of designs for the purpose, or any doubt on the part of the respective inventors of most of them that they have happened on just the thing. The engravings on our next page represent one of the latest of this numerous tribe. It rests its claims to public preference on being self-adjusting, possessing great durability and simplicity, and denoting with instantaneous precision the weight applied to it, without calculation or adjustment. "In the ordinary scale," the proprietors remark, "a multiplicity of weights are used, whilst, in the 'Geometric Balance,' one weight only is required, which, having been stamped by the proper authorities, forms the basis on which the scale is founded."

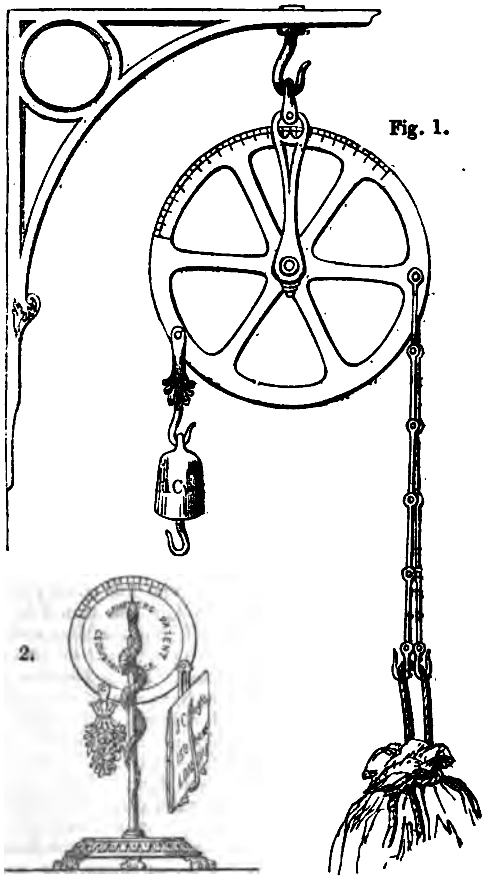


Fig. 1.

2.

The principle, they further remark, "upon which the 'Geometric Balance' is constructed being purely mathematical, renders it equally applicable to weighing the smallest particles, as well as the most bulky packages; and, in all cases, with undeviating accuracy; it is also free from those objections to which instruments acting by a spring, or other internal machinery, are always liable by change of temperature and continual use."

Fig. 1 represents a balance of this description on a large scale, adapted to shipping and other commercial purposes. Fig. 2 the same on a small scale, suitable for letters.

The article is certainly very handsomely got up, and answers, for all common purposes, exceedingly well, though, we must confess, the *geometry* of the thing—its "purely mathematical principle"—rather eludes our search. Neither do we see that anything is gained, in point of accuracy, by the substitution of the circular plate for a straight lever and quadrant though doubtless, it may be thereby (especially when in *or molu*) rendered a much more ornamental article of furniture for the library or drawing-room table.

MR. DAVIDSON'S ELECTRO-MAGNETIC EXPERIMENTS.

[The following is the letter at length from Dr. Forbes to Professor Faraday, from which some extracts were made in the communication from Mr. Davidson, published in our last Number.]

King's College, Aberdeen, Oct. 7, 1839.

"My dear Sir,—Having seen a notice from Mr. Jacobi sent by you to the *London and Edinburgh Philosophical Magazine*,* regarding the success of his experiments on the production of a moving power by electro-magnetism, I am sure it will give you pleasure to know that a countryman of our own, Mr. Robert Davidson, of this place, has been eminently successful in his labours in the same field of discovery. For in the first place, he has an arrangement by which with only two electro-magnets and less than one square foot of zinc surface (the negative metal being copper) a lathe is driven with such velocity as to be capable of turning small articles. Secondly, he has another arrangement, by which, with the same small extent of galvanic power, a small carriage is driven on which two persons were carried along a very coarse wooden floor of a room. And he has a third arrangement, not yet completed, by which, from the imperfect experiments he has made, he expects to gain very considerably more force from the same extent of galvanic power than from either of the other two.

"The first two of these arrangements were seen in operation by Dr. Fleming, Professor of Natural Philosophy in this University, and myself, some days ago; and there remains no doubt on our minds that Mr. Davidson's arrangements will, when finished, be found available as a highly useful, efficient, and exceedingly simple moving power. He has been busily employed for the last two years in his attempts to perfect his machines, during all which time I have been acquainted with his progress, and can bear testimony to the great ingenuity he has shown in overcoming the numberless difficulties he has had to encounter. So far as I know, he was the first who employed the electro-magnetic power in producing motion by simply suspending the magnetism without a change of the poles. This he accomplished about two years ago. About the same time he also constructed galvanic batteries on Professor Daniell's plan, by substituting a particular sort of canvas instead of gut, which substitution answers perfectly, is very durable, and can be made of any form or size. And lastly, he has ascertained the kind of iron, and the mode of working it into the best state for producing the strongest magnets with certainty.

"The first two machines, seen in operation by Dr. Fleming and myself, are exceedingly simple, without indeed the least complexity, and therefore easily manageable, and not liable to derangement. They also take up very little room. As yet the extent of power of which they are capable has not been at all ascertained, as the size of battery employed is so trifling and the magnets so few: but from what can be judged by what is already done, it seems to be probable that a very great power, in no degree even inferior to that of steam, but much more manageable, much less expensive, and occupying greatly less space, if the coals be taken into account, may be obtained.

"In short, the inventions of Mr. Davidson seem to be so interesting to railroad proprietors in particular, that it would be much for their interest to take up the subject, and be at the expense of making the experiments necessary to bring this power into operation on the great scale, which indeed would be very trifling to a company, while it is very serious for an individual by no means rich, and who has already expended so much of his time and money for the mere desire of perfecting machines which he expected would be so beneficial to his country and to mankind. For it deserves to be mentioned that he has made no secret of his operations, but has shown and explained all that he has done to every one who wished it. His motives have been quite disinterested, and I shall deem it a reproach to our country and countrymen if he be allowed to languish in obscurity, and not have an opportunity afforded him of perfecting his inventions and bringing them into operation, when they promise to be productive of such incalculable advantages."—*L. and E. Philos. Mag.*

HISTORICAL NOTICE OF SUSPENSION BRIDGES.

[From a Paper by Mr. G. H. Fordham in the second volume (June, 1840) of the Proceedings of the Scientific Society of London, "On the Theory of Suspension Bridges, with some account of their early history."]

Suspension bridges appear to be of very ancient origin; travellers have discovered their existence in South America, in China, in Thibet, and in the Indian Peninsula. They are most frequently met with in mountainous regions, and being suspended across a deep ravine, or an impetuous torrent, permit the passage of the traveller where the construction of any other kind of bridge would be entirely impracticable. Humboldt informs us, that in South America there are numerous

* See L. and E. Philos. Mag. for Sept. p. 164.

bridges of this kind formed of ropes made from the fibrous parts of the roots of the American agavey *(Agave americana)*. These ropes, which are three or four inches in diameter, are attached on each bank to a clumsy framework composed of the trunk of the *Schinus molle;* where, however, the banks are flat and low, this framework raises the bridge so much above the ground as to prevent it from being accessible. To remedy this inconvenience steps or ladders are, in these cases, placed at each extremity of the bridge, by ascending which all who wish to pass over, readily reach the roadway. The roadway is formed by covering the ropes transversely with small cylindrical pieces of bamboo. The bridge of Penipé, erected over the Chambo, is described as being 120 feet long, and 8 feet broad, but there are others which have much larger dimensions. A bridge of this kind will generally remain in good condition 20 or 25 years, though some of the ropes require renewing every 8 or 10 years. It is worthy of remark, as evincing the high antiquity of these structures, that they are known to have existed in South America long prior to the arrival of Europeans. The utility of these bridges in mountainous countries, is placed in a striking point of view by the fact mentioned by Humboldt, of a permanent communication having been established between Quito and Lima by means of a rope bridge of extraordinary length, after 40,000*l.* had been expended in a fruitless attempt to build a stone bridge over a torrent which rushes from the Cordilleras or the Andes. Over this bridge of ropes, which is erected near Santa, travellers with loaded mules can pass in safety.

But suspension bridges composed of stronger and more durable materials than the twisted fibres and tendrils of plants, are found to exist in these remote and semi-barbarous regions; in Thibet as well as in China many *iron* suspension bridges have been discovered, and it is no improbable conjecture, that in countries so little known and visited by Europeans, others may exist of which we have as yet received no accounts. The most remarkable bridge of this kind, of which we have any knowledge, in Thibet, is the bridge of Chuka-cha-zum, stretched over the Tehintchieu river, and situated about 18 miles from Murichom. "Only one horse is admitted to go over it at a time; it swings as you tread upon it, re-acting at the same time with a force that impels you every step you take to quicken your pace. It may be necessary to say, in explanation of its construction, that on the five chains which support the platform, are placed several layers of strong coarse mats of bamboo, loosely put down, so as to play with the swing of the bridge; and that a fence on each side contributes to the security of the passenger." * The date of the erection of this bridge is unknown to the inhabitants of the country, and they even ascribe to it a fabulous origin. The length of this bridge appears to be about 150 feet.

Turner describes in the following terms a bridge for foot passengers of an extraordinary construction. "It was composed of two chains stretched parallel to each other across the river, distant four feet from each other, and on either side resting upon a pile of stones, raised upon each bank about 8 feet high; they were carried down with an easy slope and buried in the rock, where being fastened round a large stone, they were confined by a quantity of broken rock heaped on them. A plank about 8 inches broad, hung, longitudinally suspended, across the river with roots and creepers, wound over the chains with a slackness sufficient to allow the centre to sink to the depth of four feet below the chains. This bridge, called Selo-cha-zum, measured, from one side of the water to the other, 70 feet. The creepers are changed annually, and the planks are all loose; so that if the creepers give way in any part, they can be removed, and the particular part repaired without disturbing the whole."

Numerous suspension bridges formed of iron chains exist also in China; and though the accounts which travellers have transmitted respecting them are less detailed and explicit than would have been desirable, descriptions of two of them have been furnished, which are sufficiently minute and intelligible to excite considerable interest. The first to which I refer is contained in Kircher's China Illustrata. The following is a translation of the author's words. "In the province of Junnan, over a valley of great depth, and through which a torrent of water runs with great force and rapidity, a bridge is to be seen said to have been built by the Emperor Mingus, of the family of the Hamæ, in the year of Christ 65, not constructed of brickwork, or of blocks of stone cemented together, but of chains of beaten iron and hooks, so secured to rings from both sides of the chasm, that it forms a bridge by planks placed upon them. There are 20 chains, each of which is 20 perches or 300 palms in length. When many persons pass over together, the bridge vibrates to and fro, affecting them with horror and giddiness, lest whilst passing it should be struck with ruin. It is impossible to admire sufficiently the dexterity of the architect Sinensius, who had the hardihood to attempt a work so arduous

* Turner's Embassy to the Court of Thibet.

and so conducive to the convenience of travelling." Another suspension bridge in this country is described in the 6th vol. of the "*Histoire générale des Voyages.*" The following is a translation :—"The famous *Iron Bridge* (such is the name given to it) at Quay-Cheu, on the road to Yun-Nan (Junnan?) is the work of an ancient Chinese general. On the banks of the Pan-Ho, a torrent of inconsiderable breadth, but of great depth, a large gateway has been formed between two massive pillars, 6 or 7 feet broad, and from 17 to 18 feet in height. From the two pillars of the east depend four chains attached to large rings, which extend to the two pillars of the west, and which being connected together by smaller chains, assume, in some measure, the appearance of a net. On this bridge of chains a number of very thick planks have been placed, some means of connecting which have been adopted in order to obtain a continuous platform; but as a vacant space still remains between this platform and the gateways and pillars, on account of the curve assumed by the chains, especially when loaded, this defect has been remedied by the aid of planking supported on trusses or consoles. On each side of this planking small pilasters of wood have been erected which support a roof of the same material, the two extremities of which rest on the pillars that stand on the banks of the river."* The writer proceeds to remark that, "the Chinese have made several other bridges in imitation of this. One, on the river Kin-cha-Hyang, in the ancient canton of Lo-Lo, which belongs to the province of Yun-Nan, is particularly known. In the province of Se-Chuen there are one or two others, which are sustained only by ropes, but though of an inconsiderable size, they are so unsteady and so little to be trusted that they cannot be crossed without sensations of fear."

While our attention is directed to early accounts, and to the origin of suspension bridges, it may be proper to remark, that although, as we have seen, the inhabitants of the mountainous districts of South America, or the wild and barbarous regions of Thibet, appear to have been well acquainted with the purposes for which these structures are best adapted, and to have practised their construction from the most remote ages, neither the Greeks, the Romans, nor the Egyptians, according to all we know of those nations, had any knowledge of their uses or properties, or ever employed them as a means for crossing a river, or other natural impediment. It is not, therefore, from these celebrated nations of antiquity that the engineer has derived his first hints for the construction of suspension bridges, but from those rude and unpolished people, the results of whose ingenuity have just been described.*

But it will now be interesting to inquire how far we can trace back the antiquity of suspension bridges in more civilized countries —on the Continent, in the British Isles, and in the United States of America. Scamozzi speaks of suspension bridges existing in Europe in the beginning of the seventeenth century, but it is very questionable if he employed that term to designate the same structure to which it is now applied, and this is rendered the more improbable as no such bridges are now in existence, and other writers are totally silent upon the subject. It does not appear then that suspension bridges of other than recent erection have existed on the Continent, and in England the oldest of which we have any account has not been constructed more than a century. The first suspension bridge in the United States was erected in the year 1796. In England the oldest bridge of the kind is believed to have been the Winch Chain Bridge, suspended over the Tees, and thus forming a communication between the counties of Durham and York. Mr. Stevenson (Edinburgh Philosophical Journal) expresses his regret at not having been able to learn the precise date of the erection of this bridge; from good authority, however, he concludes it to be about the year 1741. It may also be mentioned here, that at Carric-a-rede, near Ballantoy, in Ireland, there is a rope bridge, which in 1800 was reported to have been in use longer than the present generation could remember.

In the years 1816 and 1817 some wire suspension bridges were executed in Scotland, and, though not of great extent, are the first example of this species of bridge architecture in Great Britain. As, however, full descriptions of these bridges are to be met with elsewhere, it will not be necessary to notice them farther.

In 1818, Mr. Telford was consulted by government as to the practicability of erecting a suspension bridge over the Menai Strait, and was commissioned to prepare a design, if, upon an examination of the localities, he found the project feasible. Having accordingly surveyed the spot, he was led to propose the construction of a suspension bridge near Bangor Ferry, and in 1819 an act was obtained authorizing the erection of the bridge, a sum of money having been previously voted by Parliament for that purpose. This structure, which will always be regarded as a monument of the engineering abilities

* See Navier. *Memoire sur les Ponts suspendus.*

* "Rude" and "unpolished." Query?—Ed. M. M.

of Telford, was commenced in August, 1819, and opened to the public on the 30th January, 1826, having occupied 6½ years in its erection. The Union Bridge across the Tweed was designed and executed by Captain Brown, and was the first bar chain bridge of considerable size that was completed in this country. It was commenced in August, 1819, and finished in the month of July, 1820. After the completion of the Menai Bridge, bridges on the suspension principle began to be universally adopted throughout Europe; but it was not till *iron wires* had been proved to be more *firm* than *bars of a greater thickness*, that these bridges received their most extensive applications.* Since 1821 Messrs. Seguin have constructed more than 50 wire bridges in France, with the most complete success. The wire suspension bridge at Freyburg, in Switzerland, the largest in the world, was erected by Mons. Challey, and depends across the valley of the Sarine. It was commenced in 1831, and thrown open to the public in 1834. A suspension bridge has also been erected at Montrose, the size of which is scarcely inferior to that of the Menai bridge. At Clifton a very large suspension bridge is now in progress of erection by Mr. Brunel, and a suspension bridge 1600 feet in length is about to be erected over the Danube, between Pest and Offen, the design for which is the production of Mr. W. Tierney Clark, and under whose able superintendence its construction will be effected.

COLLEGE FOR CIVIL ENGINEERS.

On a former occasion we thought it our duty to speak in terms of disapprobation of the plan of this College, and of the scheme of education proposed to be adopted. We have now great satisfaction in learning that some very material changes have taken place in the direction and management of the institution, and in the course of study which is intended to be pursued in it. Immediately after the opening, on the 4th of May last, the new Director, Colonel Hutchinson, R.E., a gentleman of great engineering talent and experience, of whose professional labours in the East Indies we have had frequent occasion to speak of with commendation in our pages,* proceeded to arrange a suitable plan of tuition for the students who had been admitted into the college, to the number of about fifty. In this important business he was greatly assisted by Professor Wallace, late of Glasgow, who has long been a practical teacher of the sciences necessary to the civil engineer, and has undertaken the charge of the mathematical department of this college. The first step of these gentlemen was entirely to discard the plan originally proposed by the late Director, not only as too complex and fanciful, but as, in many respects, wholly impracticable, and to construct another more adapted to the immediate demands of the college, and more suited to the state of knowledge of the students, as well as to their future prospects in life. Between these two gentlemen, to whom the college now stands mainly indebted for its practical renovation, a new plan was speedily drawn up, and submitted to a meeting of all the professors included in it (for among the ridiculous things discarded, were not a few very ridiculous professorships, *e. g.* a Professorship of General Construction!) by whom it was, after some slight modifications, unanimously approved of and adopted.

The morning hours of each day are devoted to the mathematics pure and applied, the principles and practice of mechanics, the theory and manipulations of chemistry, the laws and phenomena of natural philosophy, and the manual labours of the practical departments of civil engineering. After proper intervals for recreation, the afternoon hours are devoted to the study of geography and its cognate sciences, to architectural, mechanical, and landscape drawing. For two hours a-week a few of the students receive lessons in Greek and Latin, from the resident chaplain, but only in compliance with the wishes of their parents, and four hours a-week are devoted to the study of the modern languages, particularly French and German.

The sooner the college abandons altogether the cultivation of scholastic lore, and the common adjuncts of modern scholastic establishments, and devotes its energies entirely to those pursuits more directly and legitimately connected with the engineering profession, the better will it, in our judgement, be for its success and prosperity, and for its ultimate elevation to the high rank to

* See particularly the account of an iron trussed roof, constructed by Colonel H., at the new Gun Foundry at Cossipore, *Mechanics' Magazine*, vol. 24, pp. 30½ and 351.

which it aspires among the institutions of the country. To show that this is what is expected by the students themselves, it need only be mentioned that when it was announced to them that the study of the classics was entirely optional, their expressions of delight were unbounded. For ourselves we are convinced that if even the few hours which are now employed in the study of French and German, were employed in field-work, such as surveying, levelling, &c., or in the construction of models of bridges, aqueducts, tunnels, &c., and of machinery of every description, the great ends of the college would be the more speedily answered, and the students would be better and sooner prepared for active employment in their profession..

NOTES AND NOTICES.

Wreck of the Royal George.—On the 22d instant Captain Pasley resumed his operations upon the wreck of the *Royal George*. Two charges, one of 47 lbs., and afterwards another of 260 lbs. of powder having been fired, the great cylinder, loaded with 25½ barrels, or nearly 2300 lbs. of powder, was sent down into the crater formed by the previous explosions. At a quarter past two o'clock, Hall, the diver, who accompanied the cylinder, came up and reported that it was properly placed. The conducting apparatus attached to the cylinder was veered out, one end being taken on board No. 4 lump, and placed near the voltaic battery, where Lieutenant Symonds now stationed himself. No. 5 lump being removed 70 or 80 yards to the southward of the spot where the cylinder had been let down, Colonel Pasley, who remained in that lump, ordered his bugler to sound the "preparative," and, in a minute afterwards, the "fire." At that moment Lieutenant Symonds completed the circuit, and an immediate explosion took place, the shock being felt, and the report heard, at the same instant. In a few moments afterwards the surface of the water rose three or four feet in a circle of moderate size, from the centre of which, almost immediately afterwards, a splendid column of water, at least 50 feet high, and of a conical form, was thrown up, and soon after several large fragments of wreck came floating up to the surface, which proved to be the lower part of the mainmast. The cylinder used upon this occasion, was of wood with iron hoops, like a mooring-buoy, made by Mr. Harding, master capstan-maker, in Chatham Dock yard, and protected by two coats of canvass, and several coats of a water-proof composition, discovered by Serjeant-Major Jones, which was found to be far superior to any in former use, as it combines absolute resistance to the greatest pressure of water, with a certain degree of elasticity that does not allow it to crack. The effects of the last explosion could not be ascertained, as the tide ran too strong for Mr. Hall, the diver, who went down afterwards, to quit his ladder, but it is presumed that it will have blown out the larboard side of the wreck, and that it will have broken up timbers in all directions. Upon the whole, there seems every reason to hope that before the end of the season the whole of the wreck of the *Royal George* will have been sufficiently removed to enable vessels to anchor over the spot, without risk of losing their anchors and cables. If so, probably Government may be induced to remove the wreck of the *Edgar* also, from which Lieutenant Symonds recently recovered five iron guns, the surface of which, after 129 years immersion, was converted into very soft carburet of iron, or plumbago, to a considerable depth. These guns are remarkable for being much thicker at the breach, and thinner at the muzzle, than guns of the same calibre of more modern construction, from which the iron guns recovered from the *Royal George* differ very little.

Wreck of the Boyne.—Mr. Abbinett, who obtained permission from the Lords of the Admiralty, some years ago, to remove the wreck of the *Boyne*, resumed his operations against it on the 24th inst., by attempting to fire a charge of 300 lbs. of powder under the larboard side. This charge had been prepared and fitted with a voltaic conducting apparatus, by Serjeant-Major Jones and Corporal Read, and a party of Royal Sappers and Miners, who came from Spithead with one of the Government voltaic batteries, to fire it for Mr. Abbinett, by permission of Colonel Pasley. They did not succeed, however, in firing this charge, and a second was sent for, which also failed; operations were thereupon postponed till the following day, when the same party of Royal Sappers and Miners came from Spithead, with another voltaic apparatus, and two more wrought iron cylinders. Col. Pasley having stated that he could only account for the previous failures, by awkwardness or mismanagement on the part of Mr. Abbinett's diver, declined permission to fire them unless some other diver was sent down with them. Mr. J. Deane, who was present, then volunteered his services, which being approved by Colonel Pasley, he placed the two charges, one under the larboard, the other under the starboard side of the wreck, and as soon as he came up they were fired by Serjeant-Major Jones, with the same success that has always attended the like operations at Spithead. The columns of water thrown up were about 8 or 10 feet high, and a great number of fish were killed by both explosions. When one of these charges was fired over the *Boyne*, it communicated a shock which was sensibly felt by Mr. George Hall, one of Col. Pasley's divers, who happened to be down at the time exploring the wreck of the *Royal George*. After the second explosion Mr. Deane went down again, and found that both sides of the wreck, which stood eight or ten feet high before the explosion, were laid prostrate, so that he could walk into the hull, which before was inaccessible from the outside. Some pieces of timber, and several copper bolts, were brought up immediately by Mr. Deane; and we have no doubt that Mr. Abbinett will be well repaid for the expense of gunpowder, &c., by the copper fastenings and fragments of the wreck which he will be able to recover.—*Abridged from the Times.*

Bell Hanging.—"A young mechanic and constant reader," at Chichester, requests to be informed of the best method of carrying a bell-wire round a circular room, with the sort of crank best adapted for this purpose?

Erratum.—The omission of a line in printing from the MS. of the first note subjoined to the extracts (p. 51), from Mr. Parkes's report on Mr. Perkins' new steam boiler, has cast an obscurity on the meaning of it, which it is very necessary should be corrected. For, "Mr. P. means the velocity of the heat, there being no current of water," read, "Mr. P. means the velocity of the heat, *strictly speaking, for his speculations immediately afterwards turn on the supposition of there* being no current of water," (but an exceedingly quick transmission of the heat through the water.)

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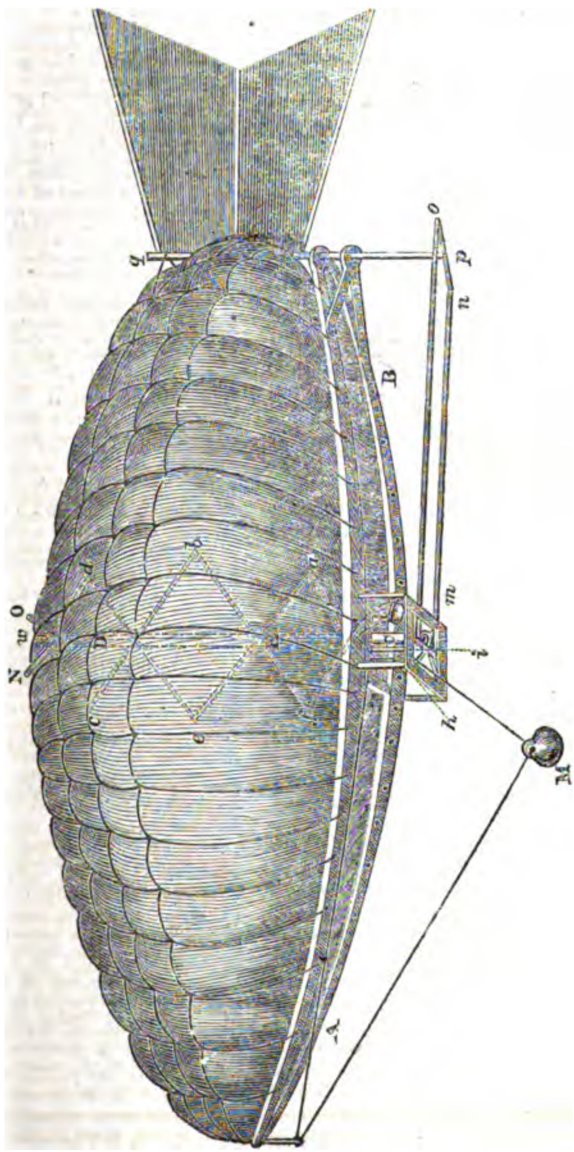


DR. POLLI'S NAVIGABLE BALLOON.

OBSERVATIONS ON THE MEANS OF DIRECTING A BALLOON. TRANSLATED LITERALLY FOR THE "MECHANICS' MAGAZINE" FROM THE ITALIAN OF DOCTOR GIOVANNI POLLI OF MILAN.

The machine with which those spaces are now traversed, which three centuries ago were thought to be occupied by an element without weight, and which the vulgar still look upon as almost a void, has always astonished every one. The bold flights which have been made with it, and the improvements which chance or art have suggested, give, there is no doubt, considerable perfection to the science of aerostation; but it is certain that we are still very far from the power of supporting ourselves in the atmosphere with the security with which we can trust ourselves upon the ocean—and though many of the obstacles and dangers which are met with in aerial voyages are inevitable, like those which are encountered in floating upon the water, there is reason to believe nevertheless that if we possessed the method of making the air machine progress horizontally in moments of calm, we should already have made a great step towards the so much wished-for voyaging in the air. An idea has occurred to me upon this subject, which, without any pretension, I wish here to set forth. It would be improper to compare an air machine to a body floating upon a liquid like a ship, because this last loses all its weight with the immersion of only one part of it, which displaces an equal weight of water, and is surrounded everywhere else by air. The ship is subject in its movements to the resistance of two fluids of very different densities, from one of which it gains the force to overcome the inertness or opposition of the other; instead of which the balloon is a body entirely immersed and suspended *in* the air, in which, therefore, it loses all its weight, and in which it ought to find at the same time the regulation of its movements and the force to overcome the resistance which the air itself opposes to it. Rudders, sails, and oars, therefore, will always be applied with little profit to balloons, and from nautical mechanics it will be in vain to expect much service to aerial voyaging. Neither can we compare with any propriety the balloon to anything flying, because the birds balance themselves and cut through the air entirely by the resistance which is occasioned by the rapid movement of their wings; they support themselves by muscular force, and as soon as this ceases, whatever advantage they may possess in the form of their bodies, the lightness of their feathers, or the faculty of introducing air into the cavities of the bones, they fall immediately to the earth. Some persons gifted with extraordinary muscular power and of small weight and size, have attempted to fly by agitating with their arms some instruments in the form of wings fitted to the shoulders, but the ill success of these experiments has proved that such an artifice was too weak to give to man the faculty of abandoning with impunity the surface of the earth.

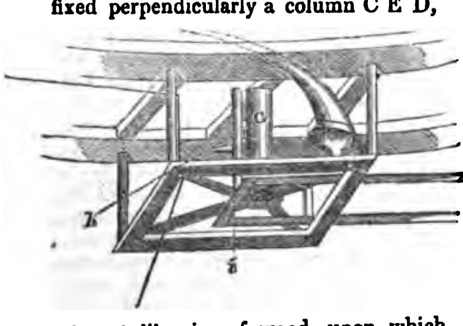
Let us observe rather the fish. Its specific weight is nearly equal to that of the liquid in which it is immersed; it is surrounded on all sides by the same fluid, and in this it finds a support for all its movements and the power of overcoming the resistance, which is opposed to its body in motion by an equal volume of liquid in repose. Now this is exactly the condition of a body in the air; let us seek then in the mechanism of the fish some hints for the direction of a balloon.

The best method of conquering nature is that of studying it and imitating its phenomena. The fish immersed in water is not in perfect equilibrium with it, but is generally a little heavier; therefore when it wishes to go to the bottom or rise to the surface it compresses or inflates an internal (swimming) bladder which is situated in the front part of the abdominal cavity, and thus acquires the lightness or density necessary to ascend or descend; there are also many small fishes inhabitants of shallow waters, which raise themselves by means of the thoracic fin, and thus overcome the slight excess of specific gravity which would be sufficient itself to keep them at the bottom. The fishes of a flat form who remain almost always at the bottom are nearly all without the swimming bladder, while it is never wanting in those who traverse freely different heights of the water, and in these such an organ for ascending is so necessary, that if it be pierced they fall immediately to the bottom, and are not able by any exertion of

their fins to rise again. The fish balanced in the water propels itself horizontally or makes a lateral movement simply by means of its tail fin, to which are attached the strongest fibres of its body. Bending its tail rapidly to the right and left it overcomes the impulses which would make it turn to either side by the two forces directed laterally, and progresses thus by the force of this single impulse directed according to its longitudinal axis. This mechanism is easily conceived even by those who are not accustomed to resolve forces into their elements, although it may be experimentally verified by any one who would place himself, for example, in a boat or gondola without oars, and by moving the rudder rapidly from right to left would see the boat progress in a straight line. Each of the two oblique forces which by this action come directly against the stern, can mentally be resolved into a direct force perpendicular to that which tends to propel it from either side. It is clear that the two sides being opposed and both perpendicular to the same right line destroy each other in their effect, and that they do not act on the poop except in the direction of its axis, which therefore sends it forward in a direct line. When the fish wishes to move to one side or the other he has only to turn the tail fin with greater force on either side, and then the horizontal right line will be modified by the prevalent lateral force, which sending the back part of its body on one side makes its head to turn to the opposite side, the middle or abdominal part being the last to move, because it is upon it that the extremities of the body turn in their lateral movements as a balance does upon its fulcrum. This is the simple mechanism which gives to the fish the power of traversing all the regions of ocean, nor to these movements are necessary the three fins on the back, beneath, and on the sides, which are seen upon many of them, because there are not wanting fishes capable of swift movements which possess only the tail fin, as, for example, all the fishes of the order "*Apodes.*" In those in which the other fins exist they are to be considered as organs of sensation rather than of locomotion. I have cut off successively the abdominal and pectoral fins from several fishes, and have not discovered the least diminution in their power of moving or the faculty of swimming horizontally or diagonally, which seemed to remain the same as before the fins were removed. I only observed that when they went to the bottom so as to touch it, they rose again a little as if molested with some unforeseen sensation of which they had not been warned by means of the fins. In other fishes I observed that the removal of the thoracic fin took from them the power of raising themselves so as to float on the surface of the water and play thereon, though it in no degree impaired the force and direction of all their other movements.

Let us now see how all this mechanism of the fish which moves in every way so freely in the water may be imitated by an air machine in its movements in the air. It will be advantageous in the first place to abandon the spherical figure of the balloon and convert it into an ellipsoid, much lengthened horizontally, because though the round form is convenient for being filled with gas, and for simply rising into the air, it is so disadvantageous on account of the resistance it meets with in moving in the same medium by which it is sustained, and it is so much more difficult to apply to it the means of propulsion, that it would be well to change the form in order to obtain the power of propelling, as well as that of rising and falling. However, all fishes have not the same form; some are cylindrical, some angular, some almost globular, some flattened on the top or the bottom or the sides, but the most general form approximates the oval, larger in the region of the thorax, and gradually smaller towards the extremities. Now, this latter form might be easily adopted for an air machine by affixing with a suitable net a long elliptical bag of taffety full of gas to a light frame placed along the lower part of it. To obtain the effect of the swimming bladder, which would give to the aeronaut an invaluable means of ascending or descending with suitable velocity without any loss of hydrogen gas, it has been thought of applying to the machine a small montgolfier (fire or lamp) that the air might be rarefied by means of heat; but though the montgolfier imitates tolerably the swimming bladder—it being indispensable for its use to bring the flame near to bodies so combustible as taffety and gas—this would be too dangerous an expedient. An attempt to

carry out this idea cost Pilatre de Rozier his life. It seems, if it could be accomplished, that there might be substituted a graduated dilatation of the hydrogen gas itself, to be effected by means of slight metallic tubes running through the bag of gas, which might be heated by means of a current of hot air, set in motion by a small spirit lamp lighted at the lower mouth of these tubes in the car of the aeronaut. But to avoid repetition and demonstrate more clearly some modifications I think favourable for the direction of an air machine, I will give to the reader a figure (see prefixed engraving) from which he will perhaps better understand the whole of my idea than I can express it in words, and to avoid extending the description unnecessarily, I will only point out those things which the figure does not represent. The material of which the bag might be constructed is the gum taffety, which is employed in the making common balloons. The little cords which fix the bag full of gas to a long frame of light and elastic wood, ought to be thicker as they approach the middle of the machine, in which place also the wood of the frame should increase in thickness, because it is towards the middle part that the lightness of the gas tends to exert the greatest force, and to which are suspended the heaviest objects. The frame A B, which runs along the lower surface of the fish-like apparatus, and represents in a manner the dorsal spine, serves to distribute to all the points of the aerial bag the ascending force and resistance with which it is charged. In this spinal frame is fixed perpendicularly a column C E D,



(fig. 2.) likewise of wood, upon which are supported the angles of the rarefying tubes *a b c d e f*, running through the gas; and in the part which passes into the car of the aeronaut, it has two rings which receive the respective axles fixed into the vertical board *i*, and moveable by means of the handle *h*. To this board *i* is confided, by means of the rudder piece *m n o*, the movement of the other perpendicular rod *p q*, which serves instead of the tail of the fish, on which depends entirely the movement of the tail fin, which might be likewise of taffety stretched upon a light frame of wood, or formed of three steel wires.

It is clear that the aeronaut by moving the handle *h*, from side to side, will easily give an analogous movement to the tail fin, and may regulate it so as to obtain, as he desires, an horizontal or lateral progression.

The rarifying tubes *a b c d e f*, may be constructed of a ductile metal of about an inch in diameter; they may be placed zigzag, because this is the line which a current of heated air most easily traverses. The tubes are open at each end and finish at the top with an orifice open towards the equatorial circle N O, on the highest point of the machine. At the bottom part they can be brought into a cone *l*, likewise metallic, under which is directed the flame of a spirit lamp furnished with 8 or 10 wicks. The lamp might be removed from the mouth of the cone by a simple mechanism articulated sideways, and each wick should carry an extinguisher, so that the body of flame might be increased or diminished at pleasure. The hot air running through the tubes would heat them quickly, and these being in contact with the gas would produce rarefaction. Now it is known that all gas dilates uniformly 0.00375 for every degree of the centigrade thermometer. Suppose, therefore, that the natural temperature of the gas is 10 degrees, that the heat of the flame applied to the lower part of the tubes raises the metal to 80, which would soon be attained; suppose further the temperature communicated to the gas near and distant from the tubes, which from the action of the heat would quickly mix, to be 40 degrees or even only 35—it is clear that the temperature of the gas would be increased 25 degrees, which would correspond to an augmentation of one-tenth of the whole volume. Thus if 900 cubical feet of hydrogen gas have an ascending force of 1,000 killogrammes, as stated in the Tables of Francœur, with the rarefaction produced by 25 degrees of temperature, it would

have acquired a force equal to that of 90 cubical feet of gas, that is, about 100 kilogrammes.

If the reader reflects now that with only 3 killogrammes of ascending force, Gay Lussac was able to raise himself to 7000 feet above the level of the sea, it is easily to be conceived how much force the aeronaut can acquire by the simple method of rarefaction. When you want to ascend then you have only to light some of the wicks under the metallic cone communicating with the tubes, and the gas soon attains a necessary lightness; when you wish to descend you must cover the wicks with the extinguisher and the progressive cooling of the gas will make the machine descend. Any one will see, besides, that this rarefaction may be regulated according to need by the number of wicks lighted, so that it is not difficult to keep yourself at a given height, in which you wish to attempt a horizontal movement, calculating the rarefaction so as to balance the natural cooling of the gas at a distance from the tubes. There might be also imagined for this purpose some measurers of the temperature of the tubes corresponding to the ascending force which the gas acquires, and by comparing them with the indications given by the instrument provided for measuring the height attained by the machine, the velocity with which it changes its direction may be ascertained. We might here, (but that it would be digressing too much) speak of the means we have imagined for the purpose, which we shall perhaps point out on some other occasion after we have tested their practical value. To descend it would suffice, generally, to extinguish the wicks, because after a voyage of a given extent, the machine has always lost a certain quantity of gas from the pores of the case, and this loss would easily counterbalance the little excess with which it set out. As it may, however, be occasionally desirable to accelerate the descent, or the volume of gas may not be sufficiently diminished to allow the machine to descend spontaneously, it would be as well to have at your disposal, by means of two cords, a valve situated at the top of the machine, by opening which you could give exit to a certain portion of the hydrogen. There should always be two cords, according to Biot, because as the life of the aeronaut often depends upon the command of this aperture, if by chance one of the strings should break he should not be without the assistance of another cord. The descent would then take place with a movement uniformly accelerated according to the laws of gravitation. It may perhaps be suitable to moderate it by a slight rarefaction of the gas, or by throwing out part of the ballast.

The bags of sand which constitute the ballast should never be thrown out to ascend, nor entirely consumed in retarding the descent, but a portion should always be kept till you are safe on the surface of the earth, to have a means ready of avoiding trees, the tops of edifices, roofs, water, &c., and to be able thus to direct the descent to a more suitable place.

To diminish the last impetus of the machine against the ground the globe M will be useful; this is a heavy sphere attached by a long string to the centre of the car, which arriving on the ground 10 or 15 feet before the rest of the machine, will lighten it of all its weight. This sphere also, by means of a continuous cord, might be brought more or less towards the front extremity of the machine, so as to transport into different places the centre of gravity, and thus place it in the air in the inclination most favourable for the descent or ascent.

The aeronaut remains in the car, *r s*, sustained in the middle of the column D E C, and on the sides of the arm of the frame A B, and manages the tail fin so as to proceed in the direction which suits him. A progressive movement is obtained by turning the fin quickly from right to left, and by repeating this action continually in the most uniform manner possible. To assist the aeronaut when he goes a journey of any extent, the electro-magnetic force might be used to advantage by a load-stone fixed to the handle, *h*, which would act upon two other horse-shoe magnets placed sideways to the first, and fixed. The attractive action might be greatly increased by an electric current given from a small galvanic trough, and conducted by metallic wires placed round the magnetic bars. By alternating the poles there will be a strong attraction of the handle from one side, and at the same time repulsion from the other, and with another change of the poles an attraction and repulsion in the opposite direction. Mechanism to change the poles after the

first impulse might be easily constructed, and might be put in play by the same movement which the handle has just taken, and thus, with little expense and with a light apparatus, you have a force which would make *our* fish progress horizontally, leaving the aeronaut at perfect liberty. Nor is it to be thought that from the movement of the tail alone the motion will be too slow, because it is known that with only this mechanism some fishes, such as the mackarel, the *Squali* and the salmon swim with such rapidity as to keep up with a ship.

It is scarcely necessary to mention that the air machine should not be entirely filled with gas when it sets out, but that a considerable portion of it ought to be left void, because, in the higher regions of the air the atmospheric pressure diminishing, the gas will dilate of itself, and the additional dilation occasioned by the rarefying tubes might easily produce an explosion. With a balloon thus disposed, all the regions of the air might be traversed with security; the ascent and descent be without danger and an horizontal direction in a straight or oblique line might be obtained at pleasure. We do not deny that a strong wind might transport the machine to distant spaces, but the fishes are subject to this inconvenience when a strong current of water disturbs the direction of their travels, though they do not cease for this to swim with much liberty in the waves. To this inconvenience ships also are subject when a periodical or temporary wind opposes itself to their progress, but they do not for this give up navigation.

When the atmospheric regions are better known and we can *peacefully* explore the different stratas of air, we shall be able to establish *anemological* observations of which we are now deprived, and by which we may greatly profit, and to these inquiries nothing would be found more adapted than our machine, with which we should not only be able to determine the direction and the laws of motion of the various atmospheric currents, but study also the causes of the most important meteorological phenomena. Finally, with this machine we shall be able to take, with the greatest facility, plans of cities, geographical outlines, levelings, &c. It may be applied too, no doubt, to a great number of other uses but little thought of before the fields of air have fallen fully under our dominion.

The present brief sketch suggested by some ideas which presented themselves to me spontaneously, cannot certainly offer that profundity of foresight and correctness of practical experience which might have been given to it, by any one who had applied himself purposely to this branch of physics, but the profession embraced by me prevents my occupying myself in such researches; those studies being too dear to me, from which knowledge useful to infirm humanity can more directly emanate. I do not wish, however, to conceal that I am constructing with some friends, whom, on occasion, I will name, a model of a machine on this plan, which may possibly convert that which is now but a speculation or theory, into a reality.

If the application succeeds I shall have pleasure in communicating the results to the public, together with whatever practical information may be gathered from the experiments.

MESSRS. JONES AND HAM'S PATENT FOR AN IMPROVED PROCESS OF MANUFACTURING CIDER AND PERRY.

The manufacture of *sweet* cider and perry is *an art*—the mere act of grinding and expressing the juice from the apple or pear, and then putting it into casks, leaving Nature to finish the operation, has no title to be dignified by that term. In the latter case the delightful acido-saccharine juice is converted by the unchecked process of fermentation into an acrid, thin, austere liquor, which no one will touch but those accustomed to it, and it is only marketable among the labouring part of the community, fetching the lowest price, whilst the manufactured article is in fact *a wine*, and as such bears a proportionately higher value. In making use of this term "manufactured," we must not be understood to imply that any foreign or chemical ingredients whatever are introduced into the liquor, and if that is ever done, the patent which we are now about to describe in as few words as possible, is intended to accomplish the effect of keeping the sweets in the cider or perry by no other method than by a rapid process of filtration.

The greater tendency of the juice of the apple or pear to run through the whole process of fermentation, above that of the grape in the southern parts of Europe, arises from an excessive

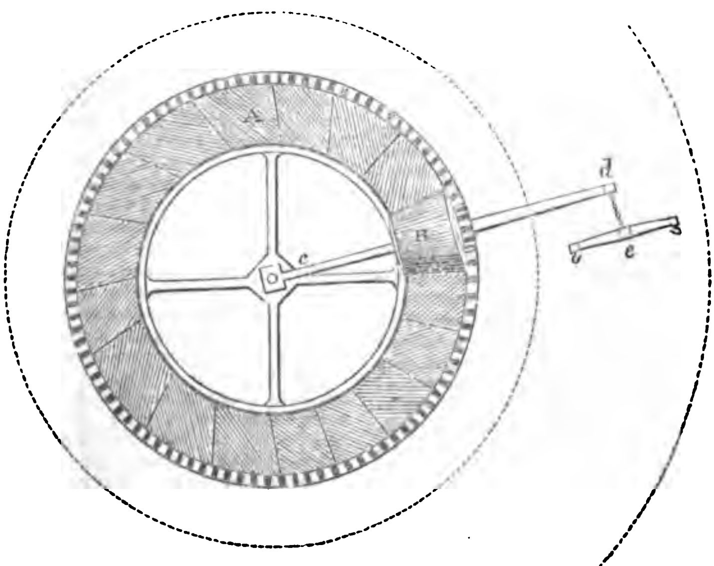
quantity of *a ferment* imprisoned in the fruit, in proportion to the quantity of pure sugar in the juice, and a considerable portion of this *ferment* must be separated before its action becomes too violent. The mode of accomplishing this by the patentees is by double bags compressed into so small a space, and yet exposing a great filtering surface, that 120 of them will not occupy a space of more than four feet square. The mouths of these bags are fastened in their places by hollow plugs, which are easily removed, so that the bags can be taken out and replaced with great rapidity when they become choked by the process of filtration; but this process would not be effectual without the use of an article which arrests all the floating feculencies that occasion the fretting and hissing, and yet adds neither taste nor smell to the liquor passing through it, and this is merely well burnt and pure wood charcoal pulverized.

The patent also includes *a mill* for grinding the fruit, different from anything hitherto in use either in Devonshire or Herefordshire. It is a roller converted into a *rasp*, by tools supplied with it, so that it can always be restored to its original roughness by any common labourer, when by use it is worn too smooth.

We have ourselves tasted cider manufactured by this process, and can truly say that never before have we met with cider of so rich a body, so fine a flavour, and withal so rich and clear.

DELL'S IMPROVED BRUISING AND GRINDING MACHINE.

(Registered pursuant to Act of Parliament, July 2, 1840.]



This machine is employed for bruising gorse or furze for feeding cattle, grinding bark for tanners, crushing oyster-shells, gypsum or other matters for manure. It consists of a circular platform or trough A of cast iron, about 8 feet in diameter, cut or dressed like a mill-ston e; the outer edge rises 6½ inches, and terminates in a series of cogs; the inner edge rises but 5 inches, and is left plain. B is a roller, 10 inches long (also dressed), having at one end a pinion, which takes into the cogs around the outer circumference of the machine. A driving shaft *c d*, passes through the roller B, which turns freely upon it. Horse power is applied to the swing-bar *e*. The principal merit of this

contrivance consists in the novel and ingenious expedient of thus communicating a rapid circular motion to the roller, while it is traversing round in its prescribed path; for it will be seen on examination, that as the shaft *c d*, is carried round by the horse, the pinion taking into the cogs on the edge of the large circle, causes the roller to revolve upon the shaft, as an axis, so that any matters placed in the trough A are subjected to an actual abrading, instead of mere pressure. The increased effect resulting from this action must be apparent; the inventor,* estimates that a roller of three hundred weight upon this plan, will be far more efficacious than one of a ton weight acting by simple pressure.

MR. HALL'S SYSTEM OF CONDENSATION.—"SCALPEL" IN ANSWER TO MR. JAMES OLDHAM.

A falcon, tow'ring in her pride of place,
Was by a mousing owl hawk'd at, and *kill'd*.†
Macbeth.

My mither's auld, sir, and she has *rather forgott ut hersel* in speaking to my leddy.—*Old Mortality.*

We'll play at bowls†.—*Richard II.*

The slight yet handsome, and *condescending* notice of "Scalpel" by a gentleman of the pretensions of Mr. James Oldham, civil engineer, of Hull, and No. 7, King-street, Cheapside, it would be uncourteous not to acknowledge. His entail I dare not dock of a single proportion, lest, in confounding him with a namesake, he should be deprived of the notoriety he courts. If the public are disposed to pay more attention to the paper of a correspondent who, in attaching his signature to it, gives, like the volunteer, evidence of courage, if of nothing else, they have more reason to complain if this volunteer takes advantage of their confidence to lead them into a false position. In such case we have a clear right to treat him with somewhat greater severity than if he had preferred the shade. We are entitled to infer that a premeditated paper of this kind has been more considered, that its author is pledged, and gives assurance to the world by his signature, that he has prepared himself beforehand to stand or fall, not alone by the veracity of facts, in their nature capable of accurate ascertainment, and stated with the positive conviction of personal knowledge, but by the truth of the evident tendency of his comments. He must needs possess more than common qualifications or confidence in his cause, who, of his own accord, quits his proper station in the ranks to attract all eyes upon himself. It is not that we require the minute graces of style, or the more laborious arrangements of a finished composition, we insist only upon the moral sublimity of truth—truth the imperishable; for "*magna est, et prevalebit.*" "Scalpel" will not descend to a personal altercation even with so respectable a person as Mr. James Oldham. Calling names does no good, and proves nothing but the loss of temper of the party. Yet it becomes necessary to test, with some degree of severity, the judgment of a writer who, with some, might perhaps carry conviction, simply because he has chosen to leave the beaten track of other correspondents.

Mr. James Oldham appears to my judgment to be either a very young man, to submit such a paper, with his name, to the comments of the public; or, as he scatters so liberally his compliments, he will forgive me saying, a not very wise old one. If the former, good-natured readers will probably look at the generous devotion of the act, and make every allowance for the enthusiastic gratitude of youth, recklessly coming forward in support of a tottering cause, though at the risk of hastening its dissolution and his own certain extinction. But the latter they will not so readily pardon. Age, without experience, only makes itself ridiculous in the exhibition of a Quixotic gallantry which should cease with the natural period for its display. As I know nothing more of Mr. Oldham than the specimen he has chosen to give of his abilities and moderation of temper, I am incapable of determining whether he is entering, or has passed, the threshold; or to attribute his warmth of language to the impetuosity of youth, or the generous devotion of antiquated friendship. But, in truth, as I can be no enemy of one whom the public never before heard of (take care Mr. Oldham that you play not too much upon the discernment of your readers, lest they surmise in thus blazoning an unknown name and duplex address to the world, that you avail yourself of a large circulation, and an impartial editor, as the mere channel for a free advertisement). I would hope, for his own sake, after this exhibition of his talents, that he has reached that period when he can set the world at defiance, secure in a competency. In an age of science never equalled, and rolling on with irresistible power, we require, in a civil engineer, a a combination of talent at least respectable to keep pace with the progression. Above all, we consider as indispensable, the possession of that judgment or common sense

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* Mr. J. Dell, ironfounder, Dudswell, Herts.
† See Mr. James Oldham's opening.

which touches so nearly the boundary of genius that we define with difficulty where one ends and the other begins. In a discussion of this kind an intellectual arena is opened for its display; we discern, at a glance, the soundness of the judgment we can refer to; or learn to show the poverty of intellect from whose feeble grasp no safe decision can be expected. When we discover the deficiency we naturally conclude it will not recommend its unfortunate possessor to the confidence of a discerning public. Though, therefore, there is neither merit nor importance in Mr. Oldham's paper it is not undeserving of notice, because of those false facts in which it abounds, and by which the advocacy of this invention is chiefly distinguished.

Mr. James Oldham at the outset gives that test of judgment I have spoken of, when he loses himself in admiration of "Tomahawk's" "excellent paper." We cannot but rejoice to find at length entering into the discussion, one endowed with that superior judgment which penetrates deeper than others, and discovers what had escaped the observation of every one else. Reposing, like all great men, in the consciousness of his own strength, he does not favour us with his reasons, and forgets that, at best, he pays a bad compliment to the sense of your readers, when, in this singular exhibition of his discernment, he gives the preference to "Tomahawk" and dismisses "Scalpel" and his statements as unworthy of further notice. If "Scalpel" names this, it is only to acknowledge the compliment and to ascertain its value by a correct appreciation of the judgment of the giver. "Tomahawk" may not be equally pleased that one at least of his numerous readers has brought to light the hidden excellence of his paper, since he is again dragged before the public. In deference to those who have favoured me with their time, it became my duty upon the authority of a civil engineer, again to refer to a paper I had deemed unworthy of more than a passing notice, lest I had, thoughtlessly, omitted those parts which had justified Mr. Oldham's discernment of its excellence. I confess I am still incapable of discovering it. To me it seems that "Tomahawk" has done nothing more than carefully avoid my statements, to avail himself of an opportunity for indulging in the fanciful reveries of a brilliant but singular invention. He first tells us a long story, with childish enjoyment, how the great Hermes prophecied, and how, like many more, he was mistaken; how he wrote pamphlets to prove himself right, and how, like many others, nobody read them, the only result of all which seems to have been that Zadig visited his mistress to worry the great Hermes aforesaid. From this interesting topic he turns with ready versatility of talent, to tell us what Falstaff said of himself; and then starts off to dilate upon abcesses bursting, with the nonchalance and enjoyment of a pupil hot from the dissecting room. Anecdotes of Irishmen's shoulders hurt with single feathers and dreading a bagfull;* Zadig, Babylon, and the great Hermes; abscesses, Falstaff, doves, and crows; together with a new and original system of ornithology, burst upon the astonished reader with the force of a various and jingling novelty, if they produce not all the effect of amusement! These are the appropriate excellencies of Mr. James Oldham's appreciation, exceedingly applicable to the point, and more suitable to his notions of entertainment for "scientific men," than the obseraations of "Scalpel!" Be assured, Mr. James Oldham, that these meretricious wanderings are but the indulgence of "Tomahawk's" misplaced, though harmless, eccentricities of a peculiar genius, that despises the trammels of composition or formalities of occasion, and only obscure the native graces of his style with the rank luxuriance of a disordered imagination. We naturally admire in others those qualities which are most remarkable in ourselves, and if "Tomahawk" and Mr. James Oldham are not one, the admiration of the latter makes them by a parity of reason "*Arcades ambo*,† *pares et similia*." There is, unfortunately for the cause Mr. Oldham supports, too much of the partisan and too little of the witness for his evidence to be received without that *caution*, with which it is customary for those who fill our seats of justice, to recommend that hot partizanship and easy testifying, should always be regarded.

Mr. James Oldham may be assured that he will not gain the confidence of the public by seeking to blind them by a repetition of those false facts, of which they have already so much reason to complain. It is not my business to surmise for what purpose facts are again displayed calculated only to mislead. All my engagement with the public was to test their value. In both my papers I have dwelt upon the *time* taken in connection with the vacuum as the criterion of power. It is the very essence of the discussion, but hitherto cautiously avoided. What does it prove, -the experiment Mr. James Oldham refers to, with only *one* vacuum gauge connected with the top and bottom of the condensers? Nothing; but that there is

* There is something singularly ingenious in the imagination that can conceive the brawny shoulder used to the hod being hurt by a feather! We begin now to see the surpassing beauties of this "excellent paper," and are indebted to Mr. James Oldham's discernment for the discovery. We must not mention the Sybarite and the rose leaf after this.

† The reader need not adopt Byron's rendering.

nearly as good a vacuum at the top at some time or other. What then? Nothing. *When* it is produced we are just as wise as before. They tried one, and after the stroke was done or nearly so, tried the other I dare say. This won't do. If this top vacuum appear only when the piston has made part of the stroke, and after the vacuum is produced at the bottom of the condenser, is there no loss of power by the slowness of the process? "*A steady effective vacuum of* 30½" is insisted on *throughout the whole stroke*, and yet on a 7 feet piston stroke, out of ten indications of *effective* power, the two first show only 12 and 16.5, and none higher than 18.7, though the steam is 6½ lbs. pressure. Truly, "these are the most conclusive answers to all 'Scalpel's' twaddle about the slowness of the process," as Mr. James Oldham judgmatically observes! Are we then, ever to have these unsatisfactory facts thrust upon us, and our time wasted in holding them up to reprobation? "S." has judiciously pointed out that the only fair test for such length of space in these condensers is to have one gauge at the cylinders, another at the condensers, to enable the time of both vacuums to be noted. Mr. James Oldham makes a parade of inconclusive facts in answer to "S.," but, though plausible enough, they will deceive no one. The solitary diagram presented to us may, too, have been selected at that happy period when the engine has behaved, as all do at times, better than usual, and be the remarkable exception to prove the reverse. No sane individual will consider it evidence of the average performance any more than an engineer without judgment and discretion is a fair sample of the average talent of his particular profession. I acquit Mr. James Oldham of wilful intention to mislead, though at the expense of an irrecoverable judgment in the eyes of the public, for bringing forward in the pages of a scientific journal, a paper of facts which, if they do not triumphantly establish my observations, he must know, or as a civil engineer ought to know, from its incompleteness, leaves the question just as disputable as ever. It is but the play of Hamlet with the part of Hamlet omitted *by particular desire*.

Since one swallow is considered no evidence of summer, neither is a solitary voyage of "excellent passages." A longer continuance of favourable winds with fine weather may urge on a steamer with a speed she may not generally attain. But since Mr. Hall's advocate, with rash zeal, *will* insist upon a comparison with the *Great Western*, let us take the past year's performance, though the directors of the *Queen* may not feel equally indebted to him for drawing it out. This will quell the new spirit he has evoked, and determine who will prefer the *Queen* when an easy journey by railway to Bristol will forward them, upon the average, a day earlier to New York, and three days sooner homeward.

	Longest outward.		Shortest outward.		Average outward.		Longest homeward.		Shortest homeward.		Average home-ward.	
	Days	Hours	Days	Hours	Days	Hours	Days	Hours	Days	Hours	D.	H.
Great Western..	21	12	13	0	16	12	15	0	12	6	13	9
Liverpool......	18	12	16	0	17	4	27	0	13	18	15	16
British Queen...	20	9	14	21	17	8	21	12	13	12	16	12

A little broader beam would, perhaps, be no injury to the *Queen*, but her lines are very beautiful, and her great length should give her considerable advantages over the shorter proportions of the *Western*.

As I cannot prove the negative of the statement fathered upon Mr. Watt by Mr. Oldham, I can only record my disbelief of the authority, from the simple fact that Mr. Watt, as Newcomen had done in an inferior degree before him, "did obtain a sufficient vacuum by external condensation to work steam-engines," and worked many of them by this means. But as probably no civil engineer except Mr. James Oldham, of Hull, and No. 7, King-street, Cheapside, would desire the honour of the discovery, that "Mr. Watt did not see (as Mr. Hall did) the science of the matter," I leave him in the enjoyment of his solitary distinction. But on behalf of the illustrious dead, I protest against charging their memory with all the loose assertions of interest or prejudice, brought forward to detract from those who have passed away, and become dear to us as our household gods, merely to enhance the questionable success of the living.

"Away detractors! servile herd!*"

* I have ventured to attribute a deeper know-

It is scarcely necessary to point out that if it be, as Mr. James Oldham so inconsiderately draws attention to, absolutely requisite to obtain this "steady vacuum" by surface, to cool the water resulting from condensation to a much lower temperature than the injection, Mr. Hall's "science" loses just so much as there is loss of fuel by the water being returned so much colder to the boilers, and consequently of power. And if what is gained one way is lost double in another, by the engine requiring much more fuel to do the same duty, where's "the great increase of power?" This is only following the argument of "Another Pioneer," but I thought it then unnecessary to refute so obvious a fallacy. Mr. Hall's small quantity of water must, as before observed, by trickling down 7,000 tubes of 9 feet long, be returned nearly, if not quite, as cold as the external water. The injection water is sent back at 90° and 100°. Is this no loss of power of itself, and a considerable loss, without deducting the 15 horses for working the extra force pumps and the slowness of the process? Can you now, Mr. Oldham, as a civil engineer, really think that Mr. Watt did not know "the science of the matter," and that by admitting considerably more injection water he would obtain a much better vacuum than is now obtained, and infinitely more effective power than any surface condensation, but that he would lose more than a corresponding power in the greater consumption of fuel?

As another instance of the futurity of thought of Mr. Watt, it is not unworthy of notice, that Dr. Priestley wrote to Mr. Watt that an experiment he had made "utterly ruined" his beautiful theory of the composition of water. "My theory," replied the great man, "is not founded on so brittle a basis as you describe." Mr. Watt was right, though the experiment of a Priestley had apparently proved the fallacy of the prediction. Again, is discovered the value and accuracy of deductions from well established laws, the operations of an unclouded mind foretelling results, detecting even the fallacy of experiments, and correcting their errors!

Mr. Oldham having, with the usual inconsiderate warmth of friendship, raised the question of the validity of Mr. Hall's patents, a subject "Scalpel" did never presume nor intend to touch upon, it may not turn out less worthy investigation for the benefit of those who have paid so dearly for it, than has proved an inquiry into the excellence of the invention. "Scalpel" may not forget the hint if his leisure permit. Be cautious, Mr. Oldham, that he shows not in a future paper you are that fatal friend of Mr. Hall, Lord Granby found in Sir William Draper.

But, sir, I come now to a more serious question, and hope, for your own sake, you will be able to justify yourself to the public for the statement. You tell us, in support of the invention, that upwards of 30 of the largest manufacturers applied for licenses, "and gave the strongest testimonies of their excellent performances." You cannot but be aware as an engineer, of the effect of this assertion upon the public mind, nor of the purpose for which you have asserted it. We are not quibbling lawyers to split a hair in the niceties of verbal criticism, and find a loop-hole for escape in the sacrifice of the spirit to the letter. You raised an inference, and so will every reader gather from it, that these, the most talented engineers in the globe, are unanimous in their approval. If true, it would not prove "Scalpel's theory and facts undeserving of consideration; but what does your assertion discover when touched by the spear of truth, but one of those false facts which every right-minded man should endeavour to put down. One* only of these thirty, so far as my knowledge goes, has spoken in its approbation, and would not venture to recommend it. If my memory serve me faithfully, it was Mr. Fairbairn, when asked if he would recommend Hall's Condensers, who observed, that "they are good for steamboats, but very complicated;" that he did not think the vacuum was so perfect by surface as by coming at once in contact with injection, and that there would be a difficulty in repairing them in the East, as there is an immense number of tubes. Mr. John Field, on two or three occasions, was also examined on the value of these "improvements;" and upon the balance of his testimony did he by one little word, turn the scale in their favour? On the contrary, he decidedly gave the preference to the common injection condenser, which certainly cannot be reconciled with Mr. James Oldham's assertion of "the strongest testimonials of the excellent performance" of Mr. Hall's Condensers, by those who had taken licenses. The firm of Messrs. Maudsley and Field supplied the engines of the *Great Western*. Did Mr. Field recommend this "original and important invention"?

ledge of human life in this translation of Horace than the author receives in the usual literal rendering of "*O imitatores servum pecus.*"

* It is many years since I read the Parliamentary evidence (Steam Navigation to India), and cannot refer to it to ascertain how many of the parties licensed were examined. I remember the impression, but, if incorrect, I desire to be set right.

Licensed to make them, the manufacturer's profit upon 14 miles of copper pipes, 14,000 joints, condensers as large as the cylinders, and extra force-pumps, with all the connecting parts, would not have been *so* inconsiderable. Do these facts bear out the meaning, or justify the intention of Mr. Oldham's assertion? We may call spirits from the vasty deep, but *will* they come? To raise an inference of "the strongest testimonials of its excellent performance," by a parade of names, a patentee may license *to make* with the rapidity and circulation of the *Times*, but *will* the licenses make his invention? The object is too obvious to require commentary. Let us have no more of such unworthy acts, or where, and when shall we place credit in testimony.

There is nothing, perhaps, so absurd in itself, which by a little judicious management cannot be brought out in a respectable light, or at least be made to produce by repetition, like drops of water upon stone, some impression upon the public mind. How many absurd schemes and nostrums do we not find creeping, at first slowly, into notice by gently feeling the public pulse; then with more boldness thrusting themselves forward, until day after day, and month after month, and year after year, we witness them blazoning forth claims to public confidence, with assurance that would be inconceivable prior to experience of so common an occurrence. What is the chief cause of the success of these practices upon the credulity of a public so appropriately called "pensive"? What is it but the numerous testimonials in their favour, which the most worthless inventions can command? The nuisance of testimonials indeed, in support of these pretensions, and the little dependence to be placed upon them, render it necessary for some master pen to take in hand these "scientific professors of certificates," who so greedily give their names to the value of an invention, with not less avidity, and without knowing much more of their real merits and bearings, than a batch of parliamentary petitioners. I throw out this hint to those capable of the Augæan task; I am content, myself, with having merely scattered the "*semina rerum*," to direct others where to gather the crop. May their sickle be sharp, and their sweep full and untiring; for truly the harvest is great, but the labourers are few. It is such persons as yourself, Mr. Oldham, who, with no wish to deceive, but full of those "good intentions" which too frequently lead to undesirable places, whether from incapacity of judgment or an easy, good-natured carelessness of investigation—receive all upon trust; and thus set these things going, or continue their progress, to the serious injury of the public, and, be assured, not unfrequent ruin of poor inventors.

Whether Mr. Oldham's prophecy of the universal adoption of Mr. Hall's condensers will be verified, "Scalpel" leaves to time to decide. Those steam companies who, with the gratifying skill and enterprize of British merchants, are fast carrying the links of one vast chain of steamers to bind nations in the closer union of a community of interests, will not probably adopt them even upon his "positive conviction." When "the great Hermes" prophesied and it was not fulfilled, it would be presumptuous in "Scalpel" to expect greater foresight. He will, therefore, venture a mere opinion in opposition to the contrary "positive conviction" of Mr. Oldham, that he also is doomed to equal disappointment.

Will Mr. James Oldham pardon "Scalpel" for reminding him, at parting, of the poor knight's recommendation to Sancho on the evening previous to the terrible onslaught of the fulling mills? This paper is the best commentary on the passage, and will lead him to its discovery "in that too true tale." *Fas est et ab hoste doceri.*

Few things appear more offensive to the man of sense, whose feelings are not engaged in a controversy, than to find one writer treating another with undeserved severity. A considerate public have, however, ever drawn a just distinction between him who, like the Templar, enters the list with the arrogant motto, *Cave adsum*, and defies all comers, and him who, with reluctance, attracts notice to himself when he is drawn from his obscurity to throw his shield over the defenceless. The former is accompanied neither by the acclamations of the audience in success, nor entitled to their sympathies in defeat; the latter will be encouraged by the one, and consoled by the other. Now, I will suppose the reader to be an enthusiastic admirer of music—that he can appreciate the labours of the profound theorist Albretch Berger, and the compositions of his great pupils the sublime Beethoven, and the varied Mozart; and that some novice, boggling at counterpoint, gives assurance to the world that these master minds did not understand "the science of the matter!" What would *he* say? Or we will suppose the reader a great enthusiast in architecture, fresh from the contemplation of the works of Palladio, or of the great Wren, the sublime magnificence of St. Paul's; and he reads that one, who is confusing himself with the various styles—declares that these did not understand "the science of the matter!" Or if he be a Grecian, that the slashing Bentley, and Porson did not understand the genius or "science"

of the language! Or that Leibnitz and Newton, the co-inventors of fluxions, did not understand "the science" of fluxions. Or that Euclid understood not the principles or "science" of geometry because some school boy could not ride over the *pons asinorum!* What would the enthusiastic admirers of each of such minds say? We must not allow *such* authorities.

"Ambiguas in vulgum spargere voces."

If too, in support of these separate statements, facts were adduced calculated to prove the assertion to those wanting discrimination to discover they are false facts, a subsequent writer at some future time would enlarge upon them, and adduce for his authority the uncontradicted statement of a scientific journal. When by positive evidence, or the equally strong evidence of circumstances, and by argument, we have convicted a criminal, we do not dismiss him with a gentle remonstrance "go and sin no more." It would not do. Justice *compels* that we make an example of him to deter others. So is the evil equally great in the world of science, when a continued detracting from the genius of the dead is permitted. The living can defend themselves. This poor creeping spirit of detraction is evidently gaining strength by sufferance. It is time to put one's heel upon it, when one wide sweeping assertion is sent forth from the land of his birth, that the great Watt understood not "the science of the matter." Minds like his are the prophets of the arts, the creators, by being the discoverers of science; each in his department, "*naturæ minister et interpres,*" lays down the laws and deduces the conditions, the principles, the very "science of the matter." How different is the enthusiastic, jealous watch of our lively neighbours, over the fame of their illustrious dead! But whilst we guard the one, we must be just in our discrimination, and not add to their fame by taking from the living, in the unphilosophical narrowness of opinion, that all connecting discoveries must stop with their first authors.*

On letting the curtain fall upon this exhibition the usual license may be permitted to one of the actors. The motives that may have influenced "Scalpel" to take part in the discussion may be surmised by many. Of these, each may judge according to his candour or malevolence. But motives can never affect a question so long as the facts are true, and the observations on them a just commentary. If the first are false, "Scalpel" has no objection to contradiction. If his deductions are erroneous, he is open to conviction. He would act contrary to his usual principles of action had he, to his knowledge, kept back *one* circumstance in favour of the invention. He has, on the contrary, shown where its true strength lies, where none other thought to look for it. But he believes the thing essentially bad; erroneous in principle, worse in application. For victory he has not contended, he has only sought truth. Did he refuse any but false facts he would abuse the confidence of the public and be open to their just reproaches for deception. But facts must come from a competent judgment, and "Scalpel" cannot hazard the forfeiture of his own, to receive them even upon Mr. Oldham's.

"Scalpel" may, perhaps, prevent further remarks on "his style," and save unnecessary discussion by one general observation, from which future writers may learn or dissent, in proportion to their temper or abilities. None of his antagonists can complain, with any pretext of right, because "Scalpel" has met each in his own department. The rules of controversy are as well established as the laws of chivalry; and he has no just cause of complaint who, choosing to attack without provocation, and selecting his weapons, is met with the weapons he adopts. When "Scalpel", in a too hasty moment, threw out his first paper, he had no thought of entering into, or continuing a controversy. His matter was in no degree previously arranged, nor premeditated, nor were his papers prepared; the notice and appearance of his replies are equal assurance that they were called forth for the occasion. This assurance will leave no room for ungenerous imputation of object. It was the twitting of injudicious partisans *alone* drew him on far beyond his time, intent or inclination. He now concludes the discussion. To pursue it further, or to reply to papers which, really, as the editor has with quick discernment observed, are so "little to the purpose," would be useless. To argue a question after it has been decided by the result, would be an inconsistency "Scalpel" will not incur. In support of his views, ascertained after they were advanced, he has already shown that the condensers have been removed from six steamers; that the managing directors of the St. George's Company, with every desire that the invention should answer, and after every trial to make it answer, have removed it from three of their boats, and intend removing it from the rest. Prior to this these gentlemen join another Company, on condition of its use in all their steamers.

* The considerate reader will draw the proper distinction between subsequent improvements or inventions, and the caution with which we should admit what would go far to establish that "the science of a matter was not understood" by the *practical* discoverer of that science—by a mind never excelled.

It is applied to one, a noble vessel, yet, notwithstanding "the extraordinary vacuum" and "its excellent performance" in the *Queen*, and all the arguments in its favour; notwithstanding the importance of "a great increase of power" so valuable at all times, and the great saving in fuel, their opinion of its merits seem entirely changed, as they refuse to apply it to their other vessel. Now, Mr. Oldham, or "Tomahawk," may, after this, in imitation of their friend "the great Hermes" aforesaid, write pamphlets with extraordinary fervour, to satisfy themselves they are right, but will they satisfy "the pensive"? To go further then with the subject, would be as great a waste of time, as to assemble another coroner's inquest to receive further evidence (after the court had, prior to its separation, been kept open for months, hearing witnesses) that it was not "a damp body," though the doctor had dissected it, explained the cause of death, and a verdict of a discriminative and impartial jury of the public had *buried* it *felo de se*. And

"So ends this strange, eventful history."

I am, Sir, your very obedient servant,

SCALPEL.

July 6, 1840.

COMPARATIVE PERFORMANCE OF THE "BRITISH QUEEN" AND "GREAT WESTERN," STEAMERS — INJECTION *versus* HALL'S CONDENSERS.

Sir,—I perceive an erroneous statement in reference to the *British Queen* which has appeared in several of the papers, has been taken up by Mr. Oldham in his letter in your last number. He says, in comparing the sailing qualities of the *Great Western* and *British Queen*, that the last voyage over of the latter "is the shortest on record." Now I have been a careful registrar of all the voyages of these two vessels, and in looking over the *Great Western's* logs I think I shall very soon show that Mr. Oldham has been misinformed, and that a quicker than the *British Queen's* crack voyage has been performed. The *British Queen*, if I mistake not, left Portsmouth on the 1st of May, and arrived at New York on the 15th, in 14 days, or, as they have it, from pilot to pilot in 13 days, 11 hours. I find, in looking over the *Great Western's* performances, that on the 18th of May, 1839, she left Bristol, May the 18th, at half-past 3 o'clock, P.M., and arrived at New York on the 31st, at 11 P.M., thus performing the voyage from port to port, not from pilot to pilot, mind ye, in 13 days and 7½ hours! And if this does not beat the *British Queen* hollow I do not know what does. To show the splendid rate at which the *Great Western* crossed the Atlantic it may perhaps be interesting to your readers to see her daily rate of miles.

May 19, 1839	160 miles.
20	202
21	220
22	248
23	240
24	240
25	234
26	240
27	264
28	230
29	247
30	240
31	191

And let Messrs. Hall, Peterson, and Co. bear in mind that this is performed not with their patent clean boiler apparatus, but with common injection engines.

I am, Sir, yours, &c.,

NAUTICUS.

London, July 6, 1840.

THE "ECLIPSE."

A new iron steam-boat has just been completed by Messrs. John and Francis Napier, of Mill-wall, said to be decidedly the fastest steamer in England. She has made several experimental trips up and down the river, and from her surprising speed and singular appearance (having two funnels and the piston cross-head working above the deck) a report has got abroad that she is driven by high pressure steam. This, however, is incorrect; she is propelled by *one engine* of 100 horse power, the cylinder is 54½ inches diameter, with four feet stroke; she has a double bottom, which gives increased strength and safety, and at the same time affords a large space wherein the steam is conveniently condensed, which keeps up a regular supply of fresh water to the boilers, saving nearly the entire power of working an air-pump. She has four separate boilers, any three of which are adequate to supply the engine; so that one may be repaired, &c. without causing any delay. The makers have met the report of "*high-pressure steam*" being used, by an offer to run the *Eclipse* against any steamer afloat, for any distance under 500 miles, with steam at a *lower pressure* than that of her opponent!

FIRES IN LONDON.

Court of Common Council,
Thursday, July 2, 1840.

A petition was presented from Mr. Benjamin Steil, of Paternoster-row, on the subject of preventing the calamitous spread of fire. It stated that the petitioner resided within a few doors of the place in which the late calamitous fire occurred; that the dread-

ful effects of that fire might have been averted by the judicious application of the means of prevention in the possession of the surrounding families, and that ladders were not only kept in the parish in which the awful calamity took place, but also in the adjoining parishes; yet, from the defects of parochial management, they were altogether unavailable for the preservation of life. The petitioner ventured therefore to suggest, as an easy and effectual remedy, that a fire-escape of the best construction should be kept in every station-house in case of the alarm of fire, and placed under the control of the Commissioners of Police. He considered the preservation of life from fire a subject of police regulation, and that the necessary expenses of purchasing fire-escapes, or the means of extinguishing fires, could be defrayed out of the police rate, and he therefore requested that the corporation would introduce into the police establishment such improvements as might afford the citizens a sufficient protection from the calamity of fire.

Mr. Steil said, upon being asked whether he had any thing to add, that he was disposed to think that there existed means under a well-regulated police of extinguishing fire without water. It was well known that without the access of air combustion could not take place. The intention was, he understood, to erect police stations in six different parts of the city. He would assume that the utmost distance of any house within the city from a station-house would be a quarter of a mile. If the alarm were attended to immediately, the fire could not attain any considerable height. He could wish that fire-proof blankets and fire-proof tow should be at hand, and that the exertions of the police, devoted, of course, at first to the saving of life, should be next directed to the stopping up of every aperture through which air might pass. He submitted that by the exercise of ingenuity in this sort of philosophical experiment an immense benefit might be achieved.

The Lord Mayor said, that he had received a great number of communications on the subject of preventing the spread of fire, and the saving of life in cases of fire, a subject certainly of the greatest importance, and which he knew from the correspondence he had held occupied the anxious attention of men of the highest scientific acquirements. (Hear.) He should take the opportunity to send to the committee some of these communications, and he should advert particularly to a letter and plan which he had received from Captain Manby, whose exertions in devising means of preservation when the lives of his fellow-creatures were in danger were so well known, and had been so efficacious.

It was the opinion of some of the members that the Society of Arts was the body to which the reference should be made, but the petition was referred to a committee, which was directed to examine the allegations, and report thereon to the court.

SIR JAMES ANDERSON'S STEAM CARRIAGE.

Dublin, June 30.

An experimental trip of Sir J. Anderson's steam-drag for common roads took place yesterday on the Howth-road, and fully answered the anticipations of all concerned. It ran for about two hours, backing and turning in every direction—the object being chiefly to try the various parts in detail. It repeatedly turned the corners of the avenues at a speed of about twelve miles an hour, and at a pressure of only about 46 or 48 pounds upon the square inch. No smoke whatever was emitted, and very little steam was observed, while even these, it is alleged, will be removed, when running publicly on the roads. The whole machinery is ornamentally boxed in, which prevents the nervousness, so often experienced in railway carriages, when the movements of the different parts are exposed to view, neither do horses show any alarm when it passes them. The directors of the English company, formed for the purpose of working out Sir James Anderson's patent, are about to assemble at Manchester, in order to witness a trial of the carriages constructed there; and it is expected that the noblemen and gentlemen forming the company will afterwards come to Dublin, it being the intention of the patentees to form a company, in conjunction with that of England, for establishing communications, by means of these drags, between the principal towns in Ireland, as soon as a few of the carriages now constructing, and in a forward state, are completed. It is proposed that the English company should in the first instance, in conjunction with the railway trains from London, run from Birmingham to Holyhead, the passengers to be thence conveyed by steam-vessels to Dublin twice a day; from Dublin to Galway by the steam drags, and thence by steam-vessels to New York, touching at Halifax. Thus making Ireland the stepping-stone between England, Nova Scotia, and the United States, and avoiding the delay and danger of beating up the channel, the most arduous and annoying part of the present route. The whole distance between London and New York will be accomplished, it is expected, in ten days. —*Morning Herald.*

NOTES AND NOTICES.

Utility of Oyster Shells.—A considerable portion of the inhabitants of London must recollect what an active bustle was carried on about thirteen years ago, by a number of carts being employed for the purpose of collecting oyster shells in the metropolis. After about two years the business all of a sudden ceased in activity, and has never been resumed since. I shall be glad if any of the readers of the *Mechanics' Magazine* can inform me for what purpose the said oyster shells were wanted, and if for manure, why the collecting of the same in such large quantities was given up? From the quantity of saline matter which is incorporated in oyster shells, I should have supposed they would have proved highly serviceable for opening the stiff clayey soils of Farnham and other hop districts. The woollen rags which are used for that purpose, costing the planter sometimes from 9*l.* to 12*l.* per ton.—E. Smith.

Paper Makers Lines.—There is an article, which in conformity with Dean Swift's axiom, "that every thing might be rendered useful," strikes me as being well adapted for making lines for paper makers—this is human hair; and if a point were made of preserving all the different cuttings in the barbers' shops and the workhouses throughout Great Britain, the annual produce would be worth many thousands. I consider it likewise better adapted for assimilating with horse hair for mattrasses and chair bottoms, than the residue of pig's bristles, or the clipping of Mogadore goat hair. All hair cutters would be glad to lay it by for purchasers, were a tolerably remunerating price offered them. There are few adults but can remember when animal bones were considered of no value, but now the retail collectors give 2*s.* 6*d.* per. cwt. for the very worst description of bones, since it has been found that they operate like a shower of gold in invigorating land.—Enort Smith.

Antiquity of Railways and Gas.—Railways were used in Northumberland in 1633, and Lord Keeper North mentions them in 1671 in his journey to this country. A Mr. Spedding, coal agent to Lord Lonsdale, at Whitehaven, in 1765, had the gas from his Lordship's coal-pits conveyed by pipes into his office, for the purpose of lighting it, and proposed to the magistrates of Whitehaven to convey the gas by pipes through the streets to light the town, which they refused.—*Carlisle Journal.*

Petrifaction.—It was stated by a member at a late conversational meeting of the Mechanics' Institute (New York) that he had seen a tree in Onondaga county, in this state, part of which was in the water and turned to stone, or petrified, and the remaining part unchanged. It is usually supposed that petrified wood (so called) is a pseudo-morphous formation; in other words, that the capillary tubes of the wood are first filled with the mineral in solution, which is gradually precipitated from the water; the woody fibres between, are next decomposed, and pass away, leaving a new set of tubes, which, in their turn fill with the mineral, and thus we have a *cast* of the wood, without one particle of the original remaining; although it resembles it so closely in appearance as to be sometimes mistaken for it.—*The American Repertory of Arts.*

French Coinage.—The *Moniteur* states that the preliminary experiments for the new coinage in copper continue to be made under the direction of Baron Thénard. The Minister having prescribed that an essay should be made of casting bars of perfectly regular dimensions, and free from all oxidation, composed of 90 to 96 parts copper, and 10 to 4 parts pewter, an experiment for that purpose has been made with cast iron moulds, and has been perfectly successful. By this method the new money will be free from all oxide, and the operation will be conducted with greater economy, on account of the cast-iron moulds being able to be worked, as they are in the Mint of London, by machinery.

Ottoman, of Papier Machée.—A singular article of furniture has been exhibiting in Birmingham during the last week, which has the advantage of being equally beautiful and novel. It is an ottoman of papier machée, intended for the boudoir of the Duchess of Sutherland. The back of the sofa is richly carved (a process for which papier machée appears to be as well adapted as wood of the finest grain,) and the seating pillows, cushions, &c., are furnished in a bright striped crimson cloth, which gives to the whole a very superb and elegant appearance.—*Staffordshire Examiner.*

Spontaneous Combustion.—Mr. Marsh, chymist, connected with the Royal Arsenal, recently discovered that it is an invariable rule with iron which has remained for a considerable time under water, when reduced to small grains, or to an impalpable powder, to become red-hot, and ignite any object with which it may come in contact. This he experienced by scraping some corroded metal from a gun, which ignited the paper containing it, and burned a hole in his pocket. The knowledge of this fact may be useful in accounting for spontaneous fires, the origin of which has never been traced.—*Inventors' Advocate.*

Patent Wrought Iron Wheels—renewal of Patent.—On Wednesday last a petition from Messrs. Piper and Riddle, the proprietors of the Patent originally granted to Theodore Jones, for the construction of Wrought Iron Suspension Wheels, praying for an extension of the term of the Patent, came on for hearing before the Lords of the Privy Council. The petition was supported by a great mass of evidence, showing the value of the invention the time lost, and capital expended in bringing it into use, and the inadequacy of the remuneration hitherto obtained from it. At the conclusion of the case, their lordships were pleased to extend the patent for the full period allowed by Act of Parliament, namely, seven years.

Opening of the London and Blackwall Railway.—On Saturday last this line was opened by the Directors and a numerous party of their friends. The trains are propelled by two stationary engines, that at the London end being of 120 horse power, that at Blackwall 70; engines of similar power are kept in reserve at either end in case of accident; to the engines are attached cast iron drums, 22 feet in diameter, weighing 43 tons, to which a tail rope is fastened which is wound or unwound by the stationary engines. The rope is not an endless one like that employed at the Euston Square station of the London and Birmingham Railway, but is in two parts, namely, one for propelling carriages to Blackwall, and the other from that place; it was manufactured by Sir Joseph Huddard and Co. of Limehouse, and cost upward of £1,200. The drums take 80 turns to every mile of the ropes, each of which are three miles and a half long. An electric telegraph, invented by Messrs. Cook and Wheatstone, communicates with the two termini, and also with the intermediate stations, so that in case of accident, information can be conveyed throughout the line in three seconds. The ropes run in sheaves placed in the centre of the rails. The first-class carriages are of the usual description, except that there are no elbows to the seats; the second-class carriages are those termed by engineers "stand-ups," having no seats—the fare, to and from any of the stations, is threepence and sixpence respectively—the journies are accomplished, on an average, in eight minutes and a half.

Upon this occasion a numerous company of distinguished guests partook of the hospitality of the Directors, and the day passed off with great eclat; not a single accident occurring to mar the joy so abundantly manifested.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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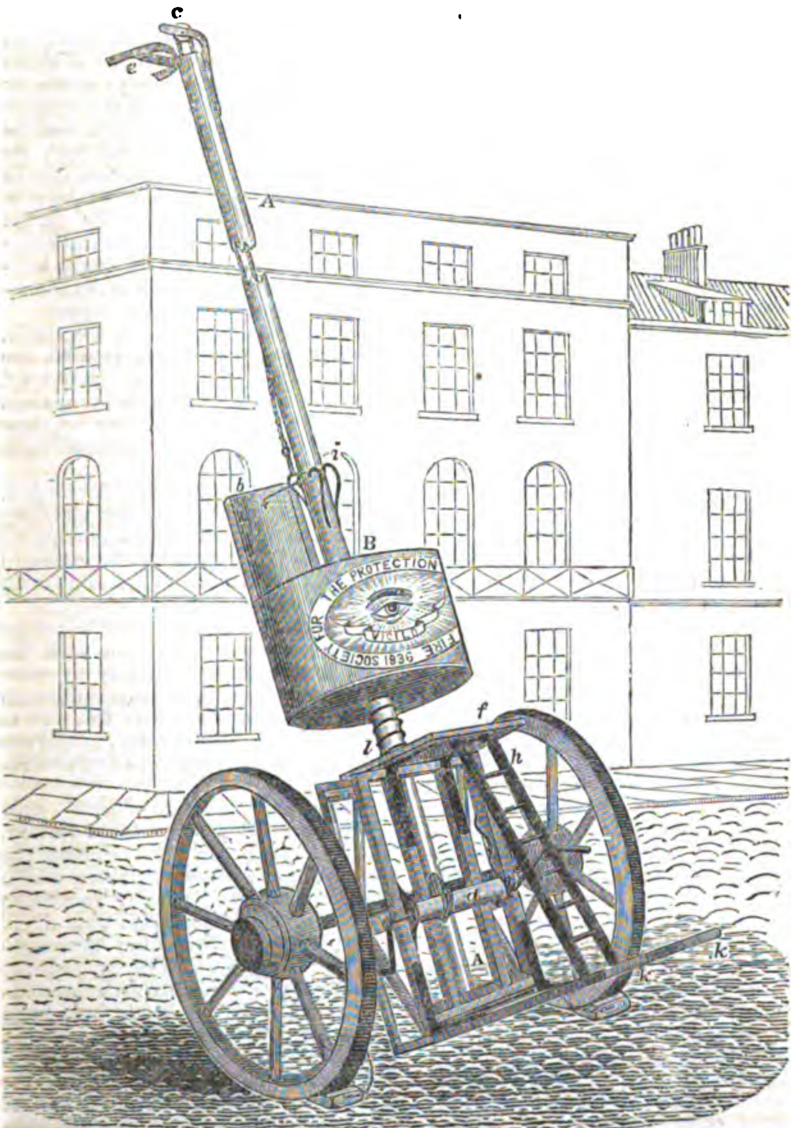
DAVIES'S FIRE ESCAPE.



DAVIES'S FIRE-ESCAPE.

Sir,—The Society for the Protection of Life from Fire, lately defunct, had adopted *four* different kinds of fire-escapes, three of which have been already described at length in your pages: viz. Merryweather's portable fire-escape ladders; Ford's pole fire-escape; and Wivell's canvass trough and ladders. I take this opportunity to complete the list, by handing you a short account of the fourth—that of Mr. Davies'; prefacing the description of the invention by a few remarks upon the inventor.

When in 1829, Mr. John Hudson attempted the formation of a Fire-escape Society, and rallied around him many of the benevolent and ingenious men of that day, among the foremost was Mr. David Davies—whose divergent-rope escape (described at page 101 of your 11th vol.) was among the best, of several ingenious contrivances brought forward at that time to facilitate the rescue of life from fire. The mismanagement and ultimate failure of that society, may be in the remembrance of some of your readers: suffice it to say, that it was owing to no want of either honesty or zeal on the part of its founders.

When the late (umquhile Royal) "Society for the Protection of Life from Fire," sent forth their flattering prospectuses, among the very first to respond to their call was Mr. Davies, who became an active member of the committee of management, and for a long time laboured hard to direct the business of the society so, as to obtain efficient protection for the public, and to reflect honour upon the exertions of the society. Opposed, however, to men whose object seemed to be personal advantage rather than the public good, no wonder he continually found himself in a minority; however, he persevered to the last in his benevolent but hopeless task.

At a considerable expense he constructed a machine of which the prefixed is a sketch, embracing some of the best features of previous inventions, arranged in a novel form, and inferior in universality of application to the *portable fire-ladders* alone.

Davies's fire-escape consists of a metallic tube A, mounted upon a light two-wheeled carriage; upon this tube, a cradle B, also of metal, is raised or lowered by means of a rope passing externally up to a pulley *c*, and then descending within the tube to a windlass *d*, furnished with two handles, a pall and ratchet. When in use, the machine is placed at a slight inclination in front of the burning building, with the forked iron *e* leaning against the wall; the wheels are *scotched* with a pair of blocks attached to the axle-tree with chains for that purpose. On turning the windlass *d*, the rope is wound round it, and the cradle ascends: when level with the window from which any person is to be rescued, the gangway, *b*, is let down on to the window-sill, when the parties in danger can walk with ease and safety into the cradle, or if in a fainting or helpless state, may be carried in by the assistant who ascends for the purpose.

The persons being safe in the cradle, the gangway is raised and secured, the cradle gradually falling to the platform *f*, from which the descent is by a short folding iron ladder *h*. There are four metal loops *i*, for the party descending in the cradle to hold on by.

There are two prolonged levers *k, k*, at the tail of the machine, for elevating or turning it with ease in any required direction. When not in use, these framed levers and the step-ladder *h*, fold up upon the body of the carriage.

The principal objections to this escape are only those which obtain with the class generally; viz., inability to enter narrow courts, yards, &c., to pass through buildings to back premises, &c., and to scale walls, mount roofs, &c., properties absolutely indispensable in a *perfect* fire-escape.

One of the "specific objects" professed by the Royal Fire-escape Society, was, "to examine into and ascertain the merits of the different inventions which may be presented to the society's notice, as calculated to facilitate escape from fire." To expect impartiality in this investigation from a society formed by, and for the benefit of a particular fire-escape inventor and renovator, would have been preposterous. Such inventors as had the temerity to court the patronage of the Society, found abundance of cold water thrown upon their endeavours, and if Mr. Davies had not been in a position to carry out his plan independently of

the Society, his escape would have been sent with many more, to "the tomb of all the Capulets." When Mr. Davies had completed his escape, it was handed over to the tender mercies of a rival, who put it through a series of the severest trials, and sought every possible opportunity to disparage its merits. One consummate piece of roguery (to which, of course, the individual alluded to could be no party,) must be mentioned:—previous to a public exhibition, the rope was haggled, so that in the course of trial it broke, though happily no evil resulted. To guard against accident from the too sudden descent of the cradle, Mr. Davies added a few turns of a strong spiral spring *l*, to receive the shock, and prevent mischievous consequences.

From the manner in which this subject is proposed to be brought forward in the city, there seems to be great hopes that there will now soon be, what there has never been before—viz., a practical scientific investigation of the relative merits of the various fire-escapes at present before the public; an investigation that must of necessity be highly advantageous, and one that will be hailed with joy by every disinterested and benevolent mind.

I remain, Sir,
Yours respectfully,
Wm. Baddeley.

Ramsgate, June 25, 1840.

ESCAPE FROM FIRE.

"*Tua res agitur paries cum proximus ardet.*"

Sir,—In the spring of 1838, you kindly inserted two or three letters from me on the above subject—one whose interest has been by no means diminished by recent miserable casualties. It gave me great satisfaction to see, by the papers, that *one* of my humble suggestions had been adopted in some degree: viz., the preparing of the "Escapes" against danger from the burning premises by some anti-combustible solution; such as that invented for the extinguishing of fires, by the excellent Captain Manby. To imagine that any reader could doubt the necessity of such a precaution, would be to insult his understanding. Any misfortune arising from the want of this (to which may be added failure from incompetent and perilous "Escapes,") would realise to the unfortunate sufferers a striking prediction, in the Psalms of the fate of certain wicked persons — "the things which should have been for their help will be unto them an occasion of falling."

Every plan of escape from fire should presuppose nervousness, agitation, and the failure of presence of mind, on the part of the persons to be saved. It would, no doubt, be very desirable for all persons to make provision against such an accident; but "nature is nature still," its weaknesses are remarkably tenacious, and it is a part of brotherly kindness to consider them. One gentleman has suggested that a person, by having a rope tied in knots, could let himself (or *herself*) down from a window. So he could from the cupola of St. Paul's, if trembling or the physical weakness of "giddiness," did not cause him to loose his hold. However, I would not dissuade from "anything," which, as better than "nothing" may be satisfactory to the mind. But where still better can by any means be obtained, I would strongly advise that they should be used.

I therefore still think, that the canvass *flexible* tube—its upper part formed like a ladder—(something similar to which is in popular use in Paris,*) is the best *internal* "Escape" that has been, or is ever likely to be invented; and for these simple reasons:—it is calculated previously to dismiss all terror from the mind—when a person has entered it, it is utterly impossible for him to fall out—and he must reach the ground in safety. And that the *next* best as an *external* appliance, is the fixed canvass tube on wheels, one of which was to be seen till lately in St. Martin's Churchyard; the use of which, if open to no objections, might have been expected to have been universal. I have, indeed, furthermore to observe, that *all* the fire-escapes I have seen are too short for the contingency of lofty houses; and I appeal to your readers, whether a failure of rescue from this cause would not be one of the most distressing cases which could happen. On the other hand, the being too long would be a very *good* "fault," or might be obviated by a length taking off in the above, the wood-work shifting by drawing out and the canvass by a button, &c.

* It was used in Geneva half a century ago.—Ed. M. M.

Of a "*Portable Staircase*," which I then mentioned as a supposed desideratum, I have contrived a plan, which I trust is perfectly practicable. I have another for the propulsion of small boats; and a third for the more distant (combined with easy) management of rudders.

I am, Sir,

Yours very respectfully,

J. D. PARRY.*

July 8, 1840.

FIRES IN LONDON.

(From the Daily Papers.)

Amongst the vast number of communications made to the Lord Mayor on the subject of the fires which take place in London, and the means of preventing the destruction of life and property, his lordship thought the following, which refers to Captain Manby's plan, particularly deserving of notice. His lordship observed, that the account of a fresh calamity from the neighbourhood of Exeter, increased the painful interest of the subject; and he trusted that the active energies of the public would be immediately called forth. His lordship expressed a fervent wish that publicity should be given to some of the communications, in the hope that Parliament, to whom Captain Manby intended to send a petition, would be induced to interfere.

"5, Chester-terrace, Borough-road,
"June 19, 1840.

"My Lord Mayor,—The great importance of the subject, and the kind attention you have shown to suggestions for averting the dreadful consequences of fire, must plead my apology for this intrusion on your notice.

"I beg to submit to your lordship's perusal some extracts from a communication which I addressed to D. W. Harvey, Esq., chief commissioner of police in your city, on the 29th May last, before fires were so rife as at present, and just one week previously to the sad calamity in Ivy-lane, which we all deplore.

"On the 17th instant I received an acknowledgement of the receipt of my communication, and an intimation that 'my suggestions' were not at present likely to be entertained by the city authorities.

"Having for the last 20 years practically studied this subject more closely and intimately than any man living (not a fireman), I cannot help feeling some surprise that such an answer should be returned, especially as it is generally understood that the Court of Common Council is likely to be moved in the matter.

"Never was more striking need for some protective measure being adopted than '*at present*,' and I should be most happy to assist, in any way that may be in my power, so great a public benefit. I beg to assure your lordship that I have no personal interest in the matter, my exertions being '*pro bono publico*.'

"I have taken the liberty of enclosing for your lordship's perusal a report of London fires for 1839; similar reports having been annually contributed by me to the *Mechanics' Magazine* for some years past.—With much respect, I have the honour to be, my lord mayor, your most obedient servant,

"WM. BADDELEY."

Extracts from a Communication addressed to D. W. Harvey, Esq., May 29, 1840, *by William Baddeley.*

"Well knowing the deep interest you take in the welfare of the corps under your command, I have taken the liberty of addressing you on a subject of considerable importance, and one relating to a branch of the service which is, I trust, susceptible of increased efficiency.

"Most of the city parishes are provided with fire-engines, but partly from the antiquity of the machines themselves, and partly from being given in charge to incompetent or inadequately remunerated persons, their inutility has been long notorious. The idea which first occurred to me on the formation of the new city police, was to suggest that the whole of these engines should, either by alteration or exchange, be made uniform in power and equipment, and attached to the police force.*

"I foresaw, however, several objections to this plan, nor do I now think it either necessary or expedient to convert this force into a regular *fire police*. I flatter myself that more good can be achieved by simpler means.

"The first thing to be attended to by the police in case of fire, is the preservation of life; and, secondly, the preservation of property. To do all that human efforts can accomplish, it is only necessary that they have at hand some convenient and ready means of making a communication with the persons in danger. The *portable fire ladders*, employed by the London Fire-engine Establishment, and very extensively adopted throughout this metropolis and in most provincial towns, surpass every other contrivance for this purpose, forming the simplest,

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* We shall be glad to be favoured with descriptions of the inventions mentioned by Mr. Parry at the close of his letter.—ED. M. M.

* Vide *Mech. Mag.* vol. xxix, page 4.

the best, and most promptly applied *fire-escape* that can be employed. They are so portable as to be of universal application. Each set consists of six ladders, each six feet and a half high, all of which fit one into the other until any required height is attained. To the top joint a pair of light wheels is affixed to facilitate the raising of the ladders by clearing projecting cornices, window sills, &c., as well as to give the ladders a broader and better bearing against the walls. From the axle of these wheels a small pulley is suspended by a universal joint, through which a rope passes, attached to a strong leather belt, by means of which sick persons, families, or persons in a stupor or other helpless state, may be rapidly and safely lowered.

"This apparatus, therefore, in proper hands, offers the means of accomplishing the rescue of life whenever human agency can avail. It is not, however, above one fire in twenty where a fire-escape is required; it is expedient, therefore, to consider how the most effectual assistance can be rendered at the remaining nineteen. This I do not hesitate to assert can be best accomplished by Captain Manby's highly ingenious invention, consisting of portable vessels charged with an *antiphlogistic fluid*. This vessel is of copper, holding about four gallons, precisely similar in form to those used in conveying the portable gas. Their use is as follows:—Three gallons of water, holding in solution a quantity of pearl-ash or other alkaline salts, is poured into the vessel; the remaining space is filled with highly condensed air; a pipe descends within the vessel to the bottom, furnished at the top with a screwed nosel and a stop-cock. On turning the stop-cock the elasticity of the condensed air drives out the alkaline solution with great force, throwing the jet to a very considerable distance.

"As the portable fire-ladders are most conveniently transported upon a light carriage, I propose to place beneath them four or six of the *antiphlogistic bottles* ready charged.

"In case of fire the police give the alarm, and from the nearest station the apparatus is brought to the spot; if lives are in danger, the ladders are instantly raised, and their rescue effected. This important object accomplished, or meantime, if sufficient assistance is at hand, a policeman slings one of the *antiphlogistic bottles* by a belt across his shoulders, and advancing towards the seat of the fire, taking up a favourable position, he turns the stop-cock, and discharges the jet point-blank upon the flames. When the first vessel is expended, a second is handed up to him, and that is also discharged, and so on until the whole supply has been expended or the fire extinguished. This *fluid* is proved to be far more efficacious than *water* in the suppression of fire, inasmuch as it leaves a coat or incrustation wherever it touches, which effectually prevents that part from re-igniting.

"One immense advantage of this plan is, that its application may be coeval with its arrival; no waiting for turncock, no want of water, nor any loss of time in getting to work.

"Under proper manegement, in the majority of instances this mode of procedure would be successful in extinguishing the fire; in all cases the flames would receive such a check, that ultimate suppression, on the arrival of the firemen with more powerful aids, would be a work of comparative ease.

"In addition to any efforts that might be thus made, it is highly essential that no delay should occur in sending for the turncock and firemen, so as to be fully prepared for the worst.

"Under such a protective system, the greatest security against the disastrous consequences of fire might be ensured, and our city would in this, as well as in other respects, stand altogether unrivalled.

"Wm. Baddeley."

The Lord Mayor stated that he had previously received the following letter from Captain Manby himself, accompanied by a copy of that scientific gentleman's admirable work "on the extinction and prevention of fires."

"Royal Barracks, Yarmouth.

"My Lord,—Having long devoted my most earnest attention to lessen human misfortunes, and among them the dreadful occurrences from fires, makes me venture, in consequence of recent most distressing conflagrations, to respectfully beg leave to call your lordship's notice, and to solicit your powerful and influential aid to carry into effect the plan proposed by me for establishing a fire police as set forth in the accompanying paper, which I drew up on the awful fire of the Parliament Houses. The object has very long engaged my thoughts, and I beg leave most earnestly to request, not only the acceptance of this little work I have put together for my friends, but to invite your attention to the subject from page 60. In the hope I may yet live to see this warm object of my heart carried into effect before I close the scene of life, being very near entering into my 76th year,—I have the honour to be, my lord, your lordship's most obedient humble servant,

"Geo. W. Manby, Capt."

At a Court of Common Council on Monday last—

The Town Clerk informed the Court that he had received the following letter from the Secretary to the Society of Arts, relative to a resolution of the Court respecting fire-escapes:—

"Society of Arts, Adelphi, July 10, 1840.

"Sir,—I have the honour to acknowledge the receipt of your communication with a copy of a resolution of the Court of Common Council on the subject of fire-escapes; that the society are now in the vacation, but your letter will be reported to them at their first meeting in November. Meanwhile the society's repository is open to the inspection of any gentleman whom the Council may depute, and I shall have much pleasure in attending for the purpose of explaining the models of fire-escapes, of which there are four or five in the society's possession.

"I am, Sir, your obedient servant,

"W. A. Graham, Secretary."

The Lord Mayor begged to state, that he had received a vast number of plans for the preservation of life and property from fire, and he had referred his correspondents to the Society of Arts, in consequence of what he considered the recommendation of that court. He much regretted the delay which must ensue before the society could investigate the plans; indeed they were *so numerous* that *months* must be devoted to the business of examination before the whole could be disposed of!

Mr. Lott animadverted strongly upon the impropriety of referring a subject of such paramount importance to the *Society of Arts*. How many fires (said Mr. Lott) may take place between the present time and November! What calamities may not be apprehended if some immediate exertions are not made to obtain efficient means of escape! As a member of the *Society of Arts* for the last twenty years, he would inform the court that *it was no earthly use to apply to that body*. Several models and designs had been sent to him, but he never thought of referring them to the Society of Arts. He should move that this matter be referred to the Police Committee.

Mr. Obbard did not think the Police Committee competent to entertain the subject—or to decide upon the merits of scientific models and experiments! (Hear, hear.)

Mr. Lott regretted to be obliged to say, that there appeared to be a strong disposition in the Court *to swamp the question*, although it was one of such immense importance. He was perfectly convinced, that if certain members of that Court, who occasionally exercised high authority, had brought forward the subject, the attention of the Court would not have been so easily *distracted*. Mr. Lott intimated his determination to persevere, and the matter was eventually referred to the Police Committee.

GEOLOGICAL SPECULATIONS—ORIGIN OF METALS.

Sir,—Some of your numerous liberal contributors may probably be interested in the following observations upon the fashionable speculations of geology—a system projected to trace and display the origin and vicissitudes of our mundane creation, from the fossil remains of animals and vegetables buried beneath the surface, at various depths and under unknown circumstances. Many of these evidences appear to be objects for surmise and wonder rather than facts for physiological induction, but if geological inquiries were more rationally directed, some practical results might be obtained. The mortuary remains of organised creatures supply the earthy *débris* which appear on the surface of the globe, and each climate and locality presents its peculiar and corresponding kind of *mould*, while the immediate substrata, and even the more settled beds of mineralised matter, often retain evidences of their descent from the surface by percolation, each particular earth, ore or metal finding out its like, as we see in pyritic nodules agglomerated in chalk hills. The universality of iron at or near the earth's surface, and the veins of metallic ores occupying cracks, or occasional vacuities at different depths, denote their subsidence from the surface; and occasional breaks in the stratification may be reasonably imputed to local earthquakes or volcanoes, while the larger displacements not assignable to gravitation may have happened from changes in the polar axis either progressive or sudden, or even to depend in some instances on new accessions from other planets. I cannot, however, regard our very limited explorations of the mere crust of the globe as likely to afford proofs of its antiquity, while the vast central mass (said to be *granite*,) remains unknown. This most curious and interesting internal carcase of the globe is supposed to consist of stone never exposed to attrition, and yet exactly compacted into one solid mass, effected by causes far above my comprehen-

sion; but because granite does not yield metals, and it seldom overlays marketable minerals, geologists have not bored into it to try to fathom its depth, although, if not the mother nucleus, it may be the second shell of the globe.

After this general notice, I may be indulged in some suggestions more applicable to human powers, by presenting a series of phenomena which may be hypothetically directed to discover the natural causes and the origin of metals; and if in one instance only I should indicate the creation of one metal in the great laboratory of nature, that may prove to be a clue to the others. Although we do not know with certainty the ultimate particles of matter, yet according to the sagacious views of Robert Hook, we may justly assume that they are spherical, and being variously combined as to juxta-position and numbers, they form the elementary crystals figured in his Micrographia, and that the several properties of each compound, result from those variable combinations—an hypothesis rather favouring the occult doctrines of alchymy and of transmutation, but supported by many physical evidences, especially those drawn from the chemical elaboratories of animals and vegetables, not yet practically applied to geology. We may, however, rationally inquire, through the means of living laboratories, into the origin and sources of such mineral bodies as are within the reach of common observation. For example, the notoriety of iron and silex in vegetables, of lime in bones and shells, and the universality of iron ores at the surface of the earth, all of them intimately connected with organic formations, show, that if not caused by those living elaborations, they are the manifest natural instruments for collecting different elements in quantities far exceeding the several proportions to be found in the watery medium which brings them together. If, again, the earths, which in many cases resemble the ores of metals, are in any instances owing to the organic chemistry of living elaboratories, a new field for research will be opened in artificial chemistry of wide expanse, but still within the scope of practical geology when limited to the evidences of organic *debris*, and to their connection with immediate substrata.

Under the foregoing very general suggestions I now proceed to invite practical naturalists to explore the earth's surface, by examining the different localities of the present creation, and their several probable durations. Some very important facts are presented by the best known mountainous diluvia, the several ravines, levels, and beds of rivers, and the local habitants of plants or trees which have been accessories to peat, clay, silex, and coal; also the coloured earths, such as clay, slate, &c. Assuming that all the permanent colours have been derived from the most dense of all the elementary substances, the metals, and hypothetically that vegetable colours have the same origin, they being, as in the example of iron, probably created in the living elaboratories of successions of vegetables, and transmitted by watery percolation to their congeries previously settled in earthy graves.

These crude sketches are submitted as "words for the wise," and hints to be worked out by practical men, aided by the vast collections already recorded by real geologists.

Your obliged reader,

ANTHONY CARLISLE.

Langham-place, July 6, 1840.

DAMPIER'S GEOMETRIC BALANCE.

Sir,—My attention has been drawn to a notice in the last number of your Magazine upon "Dampier's patent Geometric Balance." At the same time that I beg to make my acknowledgments for the favourable opinion you have been pleased to express of its merits as an useful and ornamental instrument, I take leave to claim your attention to it, as one *somewhat* at least *scientific* in its character. I am induced to do so by the concluding paragraph of the notice, from which I conceive you infer that the various graduations of weight are made by the mere mechanical operation of suspending a succession of weights and marking off the distances, as the weights are severally found to act upon the Balance; a process which, if the graduations were very numerous and minute, would not only be most tedious but likewise very uncertain. This, however, is not the case in the construction of the "Geometric Balance," the various

graduations of which are found (as the title given to the machine imports) by means of a strictly geometric figure, according to the angle of the bent lever upon which the machine is constructed; and the various parts, however numerous and minute, of the one given standard weight, appended to the machine are proposed to be graduated upon the disc. (the rules for forming which figure and scale, are given at length in the specification of my patent.) The graduated scale thus formed being mathematically true, requires that the groundwork upon which it is constructed be equally true, also; to accomplish which you will observe my application of the circular disc, as a substantial equipoised balance beam, acting at the same time as a bent lever, and not producing by the change of its position any counteraction upon the graduated scale which the quadrant or any other irregular figure must effect in every change of its position, by its own gravity and variation in leverage. The graduations being thus found by rule, give a mathematical precision to the scale which cannot be acquired by other means, and when once tested by standard weights and found to be correct, prove to demonstration the perfect construction of the machine. This mode of forming the graduated scale imparts to the instrument the greatest capability, and proves its principle to be equally applicable for dividing a grain into a hundred parts, or a cwt. into pounds, halves or quarters, whenever the ingenuity of the manufacturers shall have accomplished the making of an instrument sufficiently delicate for the purpose. Another great advantage attached to this machine is, that any greater weights may be ascertained by it than are marked upon the disc, by multiplying the resisting weight and multiplying in like manner the weight shown by the index; and by using the simple lever in combination with this machine its power may be carried to any extent.

I trust you will pardon my thus far trespassing upon your pages, and believe me, Sir,

Yours, most obediently,

CHRIS. EDW. DAMPIER.

Ware, July 6, 1840.

ON WATERPROOFING. — FRENCH WATERPROOF SOAP.

Sir,—The extreme variableness of our climate has always given great encouragement to many different schemes for communicating artificially waterproof properties to fabrics of various kinds. The extensive and successful application of caoutchouc for this purpose, as patented by Mr. Mackintosh, has given him an enduring fame—the name of the author of the process, being now familiarly identified with many articles of his production. Since Mr. Mackintosh's process "first raised his fame," waterproofing has become a kind of mania, several *new* processes have been submitted, and some *old* ones revived. The entire list of known and unknown must doubtless be extensive; of the "known" I need say little, of the "unknown" I must of necessity say less; I may however allude to the partially or imperfectly known process of Mr. Shepherd, a most ingenious and industrious man, who had a manufactory near Cheshunt a few years back, where he had succeeded in adapting common fish-oil to the production of a waterproof surface, with extraordinary success. His secret, (which if living he still preserves) consisted in a peculiar method of drying this oil, and converting it into a transparent, glossy, soft and impervious substance, upon the surface or sufaces of the materials operrated upon; I have seen silk, paper, leather, linen, &c. (adapted as a substitute for leather) finished in a very beautiful manner. His manufactory was visited by the nobility and gentry, and even by royalty itself, who could not sufficiently express their admiration of a process, by which a repulsive material was so completely changed, as to become fitted for the most elegant and tasteful applications. Notwithstanding all this, however, the patronage he received was not adequate to the support of his manufacture, and the ingenious inventor like numbers of his predecessors, pursued his experiments to his ultimate undoing.

At the present day, an ingenious artisan in Glasgow, has discovered a process somewhat similar to the foregoing, but applied to a different material—viz. *copal varnish.* I have seen specimens of linen, satin, cloth, &c. upon which he has operated, coated on one side only with a beautiful glossy and impermeable

surface, without the slighest stain appearing through; among the other specimens there was a piece of bobbin-net, all the interstices of which, were filled with a pliable transparent substance, presenting a novel and elegant appearance and promising to put a new feature upon several articles in request among our fair friends. This process would seem to hold out a reasonable promise of remuneration to any person who would furnish the means necessary for its introduction.

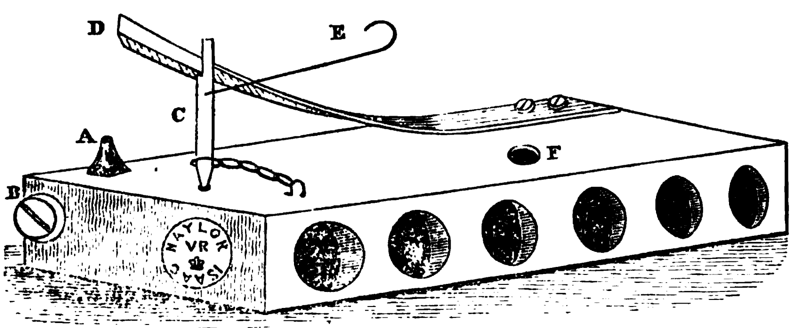
The French having caught our mania for waterproofing, have, with their usual romantic turn, proposed to enable a person to waterproof any article of clothing, at any period of time, by simply washing it with a particular kind of soap, invented by M. Menotti, and said to possess the valuable property of rendering tissues impermeable to water, without depriving them of permeability by elastic fluids. Thus for instance it is said, a peasant before going abroad or to farming labour in wet weather, has only to wash his *blouse* with the prepared soap—and dry it, when he may sally forth, proof "a la Mackintosh" against the "pelting of the pitiless storm." In order to show that this process is not an expensive one, it is stated that an ordinary *blouse* may be rendered waterproof for forty centimes—and a military cloak for twice that sum; the closer the texture of the tissue, the greater of course will be its impermeability when operated upon. M. Menotti proposes to impregnate not only the tissue itself, but also the material of which the fabric is composed, and as his preparation interferes very little with the pliability of textile substances, he looks upon success in this matter as certain. It is fair to the inventor to state, that M. M. Roubiquet and Dumas have made a favourable report to the Academy of Science at Paris, upon M. Menotti's invention, which would seem (in principle at least) to be very similar to the process recently patented in this country by Mr. T. N. Raper, who describes the object of his invention to be "to produce an insoluble compound in the fabrics or leather operated on, by the employment of suitable salts."

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

NAYLOR'S PATENT ALARM-GUN.



Sir,—I beg to send you a drawing and description of "Naylor's Patent Alarm Gun," which is intended for the protection of property and game, and which from its simplicity is likely, I think, to be extremely useful.

The machine consists of a solid piece of iron about six inches long, three wide, and 1½ thick, in which are bored six holes or barrels. These all communicate at their inner extremities with a hole bored through the metal behind them, and closed at each end by a screw, one of which is shown at B. The nipple at A, for a percussion cap, communicates with this last-mentioned bore. A strong spring is fixed on the top of the instrument by two screws, and which, when the gun is set, is strongly bent upwards and kept in its

position by the prop C, from which a small part is filed for that purpose. Into this prop is fixed the wire E. F is a hole through the gun, in order to fix it by a screw to a tree, or any other convenient place, either inside a house or out of doors.

To charge the gun, the bore B is tightly filled with a slow-burning composition, and the barrels are then charged with gunpowder in the ordinary way. A percussion cap is placed on the nipple, and the gun fixed by means of a screw, through the hole F, or to tie it with a piece of string might answer as well. The spring is then drawn up and propped by the piece C, and a fine cord is fastened to the hook of the trigger, and carried in any direction where there is a probability of access. This, on being touched, releases the spring, which striking on the cap explodes it, and fires the composition in the tube B, and the barrels are discharged one after the other at intervals.

From its capability of being so easily made proof against all weathers, it seems to be admirably adapted to be set in game preserves, and cannot fail to arouse the attention of the watchers.

The drawing is taken from a gun in the possession of a friend of mine, who obtained it, I believe, at Baker's, 73, Farringdon-street, and there was with it a box of composition for the fuse, sufficient to last for several years, and also a number of tools for cleaning, charging and fixing the gun.

I am, Sir,

Your obedient servant,

W. Scarfield Grey.

1, Cloisters, Temple, June 15, 1840.

DREDGE'S SUSPENSION BRIDGES.

In our 794th number we inserted a letter from Mr. James Dredge, explanatory of his improvements in the construction of suspension bridges, and at page 706 of our last volume, a letter from Lord Western to Lord Melbourne, setting forth the great advantages apparently embraced by Mr. Dredge's novel and ingenious plan. We have now to add, that on Saturday, the 13th of June last, Mr. Dredge performed a series of experiments before the Professors of the College of Civil Engineers, at Gordon House, Kentish Town; several noblemen and gentlemen, not professionally connected with the College were present as spectators, and they, as well as the students, appeared to take a deep interest in these experiments, the results of which illustrated, in a very satisfactory manner, both of those principles in which the essence of this improvement consists. These are, *first*, the diminution of the suspension chains, from the abutments to the centre of the pendent curve; and *secondly*, the oblique position of the rods by which the roadway is supported.

The calculations submitted by Mr. Dredge, showed that the tapered chain, had at least twice the strength of an uniform one; but his experiments proved it to have more, for an uniform chain gave way when only nine persons were standing still upon it, while eighteen persons standing on the tapered chain, had to jump before they could produce a fracture, the momentum of which must have been equivalent to a very considerable addition of weight.

That even the tapered chain is imperfect, if the roadway is supported by vertical rods, was clearly shown by Mr. Dredge in a model constructed for that purpose. This model consisted of the chains, with a spring-beam, or steel-yard at the centre, a flexible piece of timber for the road-way, and cords for the suspension rods, which could be arranged either vertically, as in chain bridges of the old construction—or diverging from the centre as in Mr. Dredge's improvement. When the cords were arranged vertically, and the roadway pressed down, the strain was thrown towards the centre of the chain, as was shown by the action of the spring, which, when Mr. Dredge pressed down the roadway with both his hands, indicated a weight of 30 or 40lbs. straining on the centre. When the suspension cords were arranged obliquely, or converging towards the centre at their lower extremities, the whole chain was called into action; and although the roadway was pressed down with equal or even greater force than before, the spring steel-yard remained quiescent, showing that there was not a single pound of unequal tension on the central part of the chains. This bringing up the whole chain into action, to whatever part of the roadway the weight is applied, is a most important feature of Mr. Dredge's im-

provements, and one which it seems the professedly learned in these matters are either unable, or unwilling to understand; but this is no reason why the benefits of it should not be understood, appreciated, and turned to practical account by the public, and especially by all who have an interest in the erection of structures of this kind. To the public, and the parties immediately concerned, it is a matter of small moment whether the inventor of that which is really useful is, or is not, a professional engineer, or a man whose is enrolled in the list of science, and is entitled to his dividend in the joint stock institution, of mutual and reciprocal praise, local or national.

ON THE VARIOUS MODES OF PROPELLING VESSELS.

Sir,—The fortunate and ingenious application of the Archimedean screw in propelling vessels lately executed and patented, does great credit to the abilities of all those concerned; for although this application has occurred to the writer, and many others, perhaps none of our ideas on this subject could have so happily effected the purpose. But although this has proved to be a very valuable discovery, yet we should never forget the possibility of adapting other powers to the same useful purpose; for instance, that undulatory motion so efficient in fishes, the power of condensed air rapidly generated and discharged, and that instrument, which I will, if you please, call a water bellows, not inaptly represented by our common fire-engine; or even steam itself propelled against water in the first instance—for although neither of these powers might be alike applicable to all navigable vessels, yet each of them might be effective under certain circumstances. We see how early the ideas of vibratory motion occurred to mankind by the drawings on Egyptain MSS., of boats put in motion by two long steering paddles in the hands of the boatman, who stands erect with his face towards the head; and how constantly the same power is still better applied to this day, by the long steering oar, which, if it could be rendered elastic and acted upon by a lever that extended to the end of the boat, or barge, and the tail made to move under water, on a rotary socket at the stern, would have a power equal to the undulatory motion of fishes, and would be manageable, on account of the length of its lever, with little force.

With respect to the power of condensed air, as manifested in the air-gun, we have nothing in the way of practical exemplification to refer to, except the mechanic action of the ink fish, against sand or water. But I think, that, as in the machine for coining, by using a spiral piston, and an arm loaded with weights, we might send condensed air through a strong valve in a horizontal direction against the water from the stern of a vessel.

Again, with respect to the water bellows, that experiment might be easily tried on board a boat by the aid of a common fire-engine, directing the discharge of water through the pipe under water from the stern. With respect to the direct action of steam—that is more doubtful, and must depend mainly on its direction, power, and quantity. Allow me also, among these general ideas, which may serve to give rise to much clearer ones, to suggest, that it may not be impossible in ascending rapids to take advantage of the velocity of the upper stream, acting on an undershot wheel at the head, by means of cranks to move powerful paddles, working in an under current, which may lead to plans for ascending inclined planes founded on the mechanism of quadrupeds; and when we shall be able to construct a balloon of that form, which universally prevails in that of all volatile bodies, then, and not before, shall we be able to fly in any direction we choose.

By giving a place to these lucubrations in your journal, you will oblige, yours, &c

G. C.

Bristol, June 24, 1840.

DR. BLACK'S THEORY OF LATENT HEAT.

Sir,—The paper of your talented correspondent "W. A. K.," on Dr. Black's Theory of Latent Heat, in one of your late numbers, contains observations well worthy of strict examination.

I think your correspondent with justice places little reliance on the numbers supposed to represent the quantity of latent heat in bodies. Can we, in reducing the temperature of a body, attain that point, below which further radiation

becomes impossible? Can we, by this means, abstract the whole of its heat, and thereby determine the natural zero of its temperature? This we have never done, and, perhaps, never can. Yet this must be done before the quantity of its latent heat can be determined.

"W. A. K." asks, "Is there such a thing in nature as latent heat, except electricity?" To this, I believe, we can mainly give an assent. But this identity we are unable to demonstrate fully, owing to the small advance hitherto made in electrical knowledge. The thermometer shows that all bodies are susceptible of a rise and fall of the temperature; but the electrometer does not indicate, with the same generality, the existence of elective action in all bodies indifferently. This would appear to imply that latent heat is the cause of electricity, rather than electricity the cause of latent heat. This is the opposite of the view entertained by "W. A. K."

I think "W. A. K." has somewhat mistaken Dr. Black's theory. As I understand it, the capacity of a body for latent heat, is diminished by its contraction, and increased by its expansion. Those instances adduced as being in opposition to that theory, I cannot but consider as the highest proofs of its truth. Thus if the hand be held to high pressure steam immediately opposite the out-let where it escapes, it will not be scalded, but rather cooled; but if held at a distance, scalding occurs. Agreeably to Black's theory, high-pressure steam, owing to its sudden expansion on its escape from the outlet, has such a sudden pressure in its capacity, that it is more disposed to abstract heat from the hand than to impart heat to it; accordingly it does not scald but cools the hand. But when the hand is held at a distance, and time allowed for the condensation of the steam into moisture or water upon it, contraction equal to 1600 occurs, a diminution of capacity is produced, heat imparted and the hand scalded.

Again, when sulphuric acid and water, in the proportion of four and one, are mixed, contraction occurs, the two fluids occupying less space than when separate; there is diminished capacity of heat equal to 300° imparted, capable of boiling an egg, almost instantly.

Moreover, when a metal by friction or hammering, has its parts compressed, its capacity is diminished and its latent heat given out. When flint, too, is struck against steel, compression and diminution of capacity occurs, and heat is given out.

All these instances are strictly in accordance with Black's theory.

Although, with W. A. K., we may admit that the heat elicited during chemical action, friction and hammering of iron, or when removed from the blacksmith's forge, during explosion, solar action, and terrestrial rotation may be an electrical phenomenon—still, unfortunately, we yet want proof of it.

W. A. K. considers the earth to be analogous to the cylinder of the electrical machine, producing an electrical action during its diurnal rotation. That the temperature of the tropical regions is greater than that of the polar, because the space passed through—the friction—and the consequent electric action in the former case, are greater than in the latter. But we are not informed how this necessary friction is produced, or what body stands in relation to the earth, as the rubber does to the cylinder of the electrical machine. The analogy is therefore incomplete. Black's theory informs us that as the tropical parts are less dense than the polar, they have a greater capacity, and consequently contain more heat than the latter. Hence the observed difference of temperature.

W. A. K. attributes the expansion and contraction of iron during change of temperature, to the atmospheric air contained within its pores; the metal itself remaining unaffected. But I am not aware that the existence of this air in the metal has ever been proved. Indeed the fact appears impossible, for what should prevent the metal when its temperature becomes elevated, undergoing its usual change, combining with the oxygen of such air, and forming an oxide. Such air therefore cannot be atmospheric, although it may be nitrogen.

The subject of the connection between the latent heat of bodies and their supposed electric fluid, has frequently been discussed at the meetings of the Electrical Society, and will be found in their reports

I think W. A. K. will find it nothing more than what is due not only to the memory of Dr. Black, one of the greatest and most simple of philosophers, the fellow labourer of Watt, but also to the importance of the subject, second to none, to reconsider his views respecting latent heat.

If you consider the above observations of sufficient importance you will oblige by their insertion in your valuable publication.

I remain, Sir, your obedient servant,

LATENT.

June 29, 1840.

NEW MODE OF ADVANTAGEOUSLY COMBINING THE POWER OF SAILING AND STEAMING AT PLEASURE.

Sir,—The great difficulties that occur in fitting vessels for sailing as well as steaming, and the great necessity there exists for overcoming them, have caused numbers of inventions to be brought forward for that purpose, but they have all hitherto proved failures. I therefore beg to state through your columns, that I have invented an entire new mode of propelling vessels by steam, which is neither on the screw nor the paddle-wheel principle. The use of cranks and cumbrous and complicated engines is done away with, no other parts being required but the cylinder, piston, and piston rod, which conveys the full force of the steam to the propeller. A vessel of 25 feet in breadth would be propelled forward 50 feet by each stroke of the engine, without any multiplicity of gear-work. The apparatus can be fitted to sailing vessels that are already built, without altering their form or obstructing their sailing conveniences. It is admirably adapted for men of war, the machinery being so diminished that it is placed under the water line, and thereby secured against injury from shot. Further, by means of a simple lever, the course of the vessel can be reversed, or she can be put about in either direction within her own length, without stopping the course of the engine. I have carried out the experiments to a great extent in secrecy, and now wish to treat with a party who has the necessary means and influence to patent my invention and bring it before the public on an extensive scale. The expense will be very trifling compared with that required for other plans. Any person disposed to take up the matter may apply by letter, pre-paid, when an appointment will be made for seeing a model in motion.

I am, Sir, your obedient servant,

WILLIAM MILL.

18, Green-walk, Holland-street, Blackfriars-road, July 8, 1840.

ON THE PRESENT DEFECTIVE QUALITY OF PENS AND QUILLS.

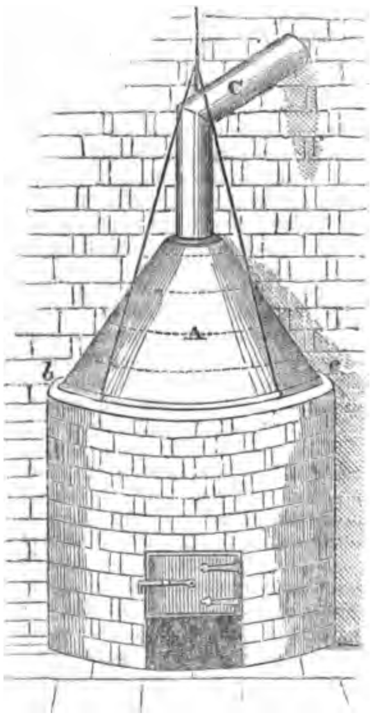
Sir,—While improvement is making rapid strides in almost every department of public utility, and while "the schoolmaster is abroad," as Lord Brougham terms it, from the Land's End, to John O'Groat's, it is surprising that an article which is known to be essentially necessary to the wants of almost every being in the community, should remain so lamentably deficient in the good qualities which are required of it. I allude to the original writing pen, or its parent, the "grey goose quill," in its manufactured state. To prove this, let any person go to half-a-dozen stationers and buy three or four pens at a penny a-piece; I will venture to assert that he will not find a single good pen in the whole collection. I tried two shops in the Borough, two in Cheapside, and two in Whitechapel a few weeks ago, and purchased four pens at each of them at one penny each, and they proved such rascally soft nibbed things that they were scarcely worthy to sign the death-warrant of a well-fed porklin; as for mending them, they were as obstinate as an oath-administered Irishman—refusing upon any terms to *split*, as they were in duty bound to do. I see Mr. Tegg, the bookseller, who, like Jonathan, has no objection to turn an honest penny in more ways than one, exhibits in his window some tasteful boxes of "ladies nicknackeries," imported from Paris. Among various other articles, there are some beautifully transparent looking pens, cut short to fix into handles: if the article in its writing capabilities is as good as it looks, I beg leave to say that it is greatly to the discredit of the pen manufacturers of this country, that our Gallic neighbours should excel us.

I remain, Sir,
Your obedient servant,

ENORT SMITH.

[If our intelligent correspondent had gone to a respectable stationer's and purchased a quarter of a hundred of pens or quills at 8s. per hundred, he would have got one pen more for his *two shillings* and a very different article, we suspect, from that which roused his ire. The necessary profits of the *retailer* press heavy upon the buyers of small quantities of all kinds of manufactured goods. ED. M. M.]

STEAM FUNNEL FOR WASH-HOUSES.



Sir,—As no answer has appeared to the inquiry of your correspondent respecting the best method of getting rid of that nuisance steam, I conclude your scientific readers who have not visited the wash-house, consider it a subject beneath their notice. If, however, you are willing to receive a communication from a correspondent, not scientific but practical, I will state the method I have adopted, and which I have found an effectual remedy for the evil complained of; it is merely a canvass bag A, distended or kept open by a wooden hoop *b c*, a few inches larger than, and resting upon, the top of the copper; it is made taper at the other end, and fitted to a zinc pipe C, that conveys the steam into the chimney. My kitchen is as free from steam as my parlour, except when the hoop is raised on one side,* to take water, &c. from the copper: there is, of course, then a little escape of steam, but as that is only for a short time. I it occasions very little inconvenience. A 6 inch pipe will be found sufficient for a boiler of from 20 to 30 gallons. It is best for the lid of the boiler to be taken off when the water boils, as the steam more readily ascends into the chimney; my zinc pipe is made with a flange, or shoulder, by which means the canvass hood is readily affixed by means of a string that is made to draw it close. As the plan may be tried for a few shillings, I hope your correspondent will adopt it, and I shall be glad to hear through the medium of your valuable Journal of the success he has attained.

Yours, &c.

M——.

June 30, 1840.

* Our draughtsman has represented the canvass hood as raised by three cords attached at three equidistant points on the hoop and united into one at the top, which, being passed through a ring affixed to the ceiling, raises the hood very conveniently without closing the aperture against the continued escape of the steam.—Ed. M. M.

AUTOGENOUS SOLDERING—MR. SPENCER IN REPLY TO MR. DELBRUCK.

Sir,—Perceiving in your last monthly part, that one of its numbers contained a letter from Mr. Delbruck, in relation to my paper on soldering metals, I am somewhat anxious to set myself right, in the opinion of that gentleman and yourself. In the first place, I am perfectly unacquainted with the laws relating to patents, or with the rights of patentees in detail, although I must confess I have hitherto looked on them as a whole with no very favourable eye, conceiving they often retarded the interests and advancement of true science, which unfavourable opinion on my part, has been latterly very much heightened by the conduct of M. Daguerre, in relation to the invention that bears his name.

In most instances, real improvements can only be made in a process, by those who are already familiarised, by practice, with its use; consequently the more extensive the practice, the greater the chances of improvement; but the rights of patentees, necessarily narrow these down to the few, who can be induced to take out licences for its application; but this is not the only evil: should the process be a profitable one, a dishonest

spirit of ingenuity is then brought into play, with a view to defeat the legal rights of the patentee, by substituting some trifling alteration in his process, which I believe is too often attended with success; and at all events the energies and money of both parties are wasted in litigation. I cannot, however, blame those who take advantage of the laws as they now stand, to secure to themselves the fruits of their ingenuity, and very often their industry, and should circumstances render it necessary, I might avail myself of them; but I find fault with the law for extending the period beyond seven years in any case; the sum of money too, to be paid in the first instance is by far too much, giving, as it does in many cases, *half* the profits of the invention, to the richer friend who advances the amount necessary to be paid on the occasion.

As regards myself and Mr. Delbruck, I was first made aware of his process, by your Magazine; there it was ascribed to M. Richemont, my impression being that Mr. Delbruck had merely licenced its use from the former gentleman. At the same time being unacquainted with the time required to complete a patent legally, it appeared to me, that the whole had been done within, at most, a few weeks; but still I thought it highly probable that M. Richemont, had *in his own country* practised it first. As respects the similar process by myself, it was discovered, if I may use the term, four months previous to my or the English *public* knowing anything of Mr. Delbruck. I then mentioned it to friends; a month afterwards it was announced as a paper I would read at the Polytechnic Society, in a letter to the Rev. T. Dwyer, the secretary. The paper as printed by you was then written, with the exception of the few remarks at the end. It was accordingly announced by printed circular for the March meeting of the society. A most important engagement rendered me unable to be present on the evening of meeting, and another paper was read; mine was afterwards announced for the May meeting, and read. During the whole of this time I made no secret of the matter, as I had intended it for the public; perhaps fifty persons were made acquainted with it *before the publication* in your pages of M. Richemont's invention. I am unable to say what would have been the fate of the patent, if my paper had been read when it was first announced, as it would then have been published in one of our local papers. However as the matter stands, I can assure Mr. Delbruck it never was my intention to take any advantage of this to defeat his patent, even had the law allowed it; and now finding it was sealed so long previous to the period my process was brought forward, I shall not willingly throw any facilities in the way of others attempting to evade it, even were that possible.

Yours respectfully,

THOMAS SPENCER.

PEARCE'S NEW ECCENTRIC COUPLING.

Fig. 1.

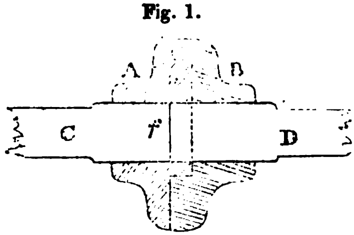
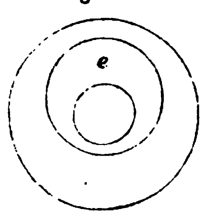


Fig. 2.



SIR,—The following is a description of a coupling for mill-shafts, which I think will answer in all cases as well as the common clawed coupling. I have no doubt but some of your readers are aware of the labour and expense necessary to the fitting of a coupling of the latter kind. For, if the claws are not made to fit each other with considerable accuracy, the coupling will not have its full strength.

The one which I propose, is represented by the above two figures. It is made in two parts, as shown by the section, fig. 1. There is a projecting piece on the face of A, as shown at *e*, figs. 1 and 2, and the

face of B has a corresponding cavity made to fit it. C and D are the ends of the shafts; the shaft D is made to project into the coupling A, as shown at *f*. It would be a waste of time to enter into further explanation, for it must be evident that when each part of the coupling is made fast on its own shaft, and the two faces are brought together as in fig. 1, the one shaft cannot possibly turn round without the other.

The whole of the workmanship required by a coupling of this kind is as follows. The faces of A and B must be accurately turned to fit each other; then both parts being fastened together the hole may be bored clean through, when it may be put on a mandrill and the whole turned, and polished if required.

Your obedient servant,
JOHN C. PEARCE.

Leeds, July 6, 1840.

MR. SPENCER ON FURTHER IMPROVEMENTS IN THE VOLTAIC PROCESS OF MULTIPLYING WORKS OF ART IN METAL.*

Sir,—I take this opportunity of laying before yourself and readers a brief detail of a still further improvement of my voltaic process of multiplying works of art in metal. In my pamphlet, printed last September (*Athenæum*, No. 626), I there stated I considered the process comparatively incomplete, unless we were able to apply it to the multiplication of models in clay or wood, castings in plaster, wood engravings, &c., as the fact, that galvanic deposition always requires a metallic surface to act on, seemed to set bounds to its application. I then resorted to various expedients to surmount the difficulty,—among others, that of gilding and bronzing the surfaces of such materials, and to a limited extent this was successful, but still troublesome and expensive, and, more than all, the sharpness and beauty of the original was necessarily injured. I have since attempted to metallize surfaces by the use of plumbago (suggested to me many months ago by Mr. Parry, of Manchester). This last possesses the faults common to the others, and in most instances the deposition goes on partially.

I am happy, however, to inform you, I have now adopted a method which answers completely, obviating all these objections, and leaving the surface of the material acted on, as sharp as it was previous to the operation.

Should I be desirous of obtaining a copper mould or cast from a piece of wood, plaster, or clay, or other non-metallic material, I proceed as follows: Suppose it to be an engraved wooden block, and I am deirous of metallizing it, in order that I may be able to deposit copper on its surface, the first operation is to take strong alcohol, in a covered glass vessel, and add to it a piece of phosphorus (a common phial corked will answer the purpose); the vessel must now be placed in hot water for a few minutes, and occasionally shaken. By this means the alcohol will take up about 300th of its bulk of phosphorus, and we thus obtain an alcoholic solution of phosphorus. The next operation is to procure a *weak* solution of nitrate of silver, place it in a flat dish or a saucer; the engraved face of the block mustnow be dipped in this solution, and let remain for a few seconds, to allow capillary action to draw it into the wood.

This operation being performed, a small portion of the alcoholic solution of phosphorus must now be poured in a capsule or watch-glass, and placed on a sand-bath, that it may be suffered to evaporate. The block must now be held with its surface over the vapour, and *an immediate* change takes place; the nitrate of silver becomes deoxidized, and gives place to a *metallic* phosphoret* of silver, which allows the voltaic deposit to go on with as much rapidity and certainty as the purest silver or copper.

This example will hold good for most other materials.

The whole process may be performed in a few minutes, and with absolute certainty of success. The interior or exterior surface of a plaster or clay mould, or that of a statue, no matter what size, may be thus metallized with equal facility. For

* A hastily written and in several respects imperfect account of these additional improvements, appeared in a letter from Mr Spencer in the *Athenæum*, of the 4th instant. The present is from a copy of that letter revised and corrected by the author. —ED. M.M.

* Subsequent experiments incline me to think, that metallic silver is thrown down and phosphoric acid is formed.

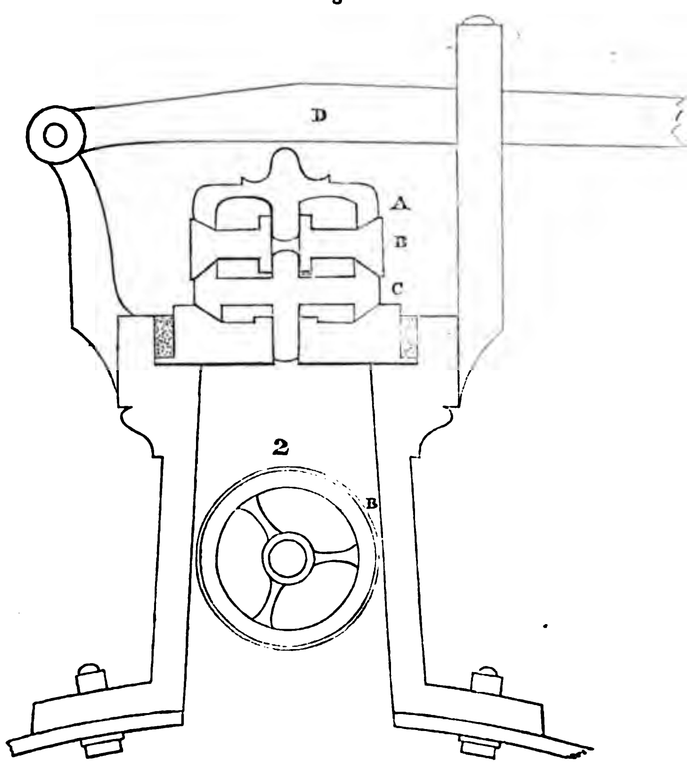
the process of vaporizing, and should the material to be acted on not be large, I prefer fastening it to the top of a bell glass receiver with a bit of pitch or cement, and thus placing it *over* the capsule on the sand bath; the phosphoric vapour is by this means equally diffused, and not dissipated, An ethereal solution of phosphorus also answers; and a solution of either of the chlorides of gold or platinum may be used. I am inclined to think this process, independent of its uses in galvanic precipitation, may be applicable to other branches of art. I would recommend those desirous of testing its effects, to try a small and sharp plaster of Paris medallion: dip its *surface* in a weak solution of nitrate of silver and *take it out immediately*, fasten it to the interior of a glass tumbler, and at the same time have a little hot sand ready in a dish; lay the watch glass containing a few drops of the phosphoric solution on this; now place the mouth of the tumbler over all, and the medallion will be observed almost instantly to change colour. The operation is now completed, and the substance so operated on, may be placed in the apparatus already described and treated in every respect as if it were solid metal.

THOMAS SPENCER.

Liverpool, June 27.

CRICKMER'S COMPOUND SAFETY VALVE FOR STEAM ENGINES.

Fig. 1.



Sir,—I consider any improvement in so important an apparatus as the safety-valve of steam-engines will be of importance for insertion in your valuable pages. I have repeatedly found the valve adhere to its seating, commonly after priming or blowing with a mixture of steam and water, which happens most

frequently when the boiler is getting foul. The impurities held in solution by agitation, on the rising of the steam, bubble up through the water from the generating surface, and have strong cementing qualities. I have repeatedly found valves of 4 and 5 inches area with a pressure of 30 and 40lbs. per square inch under them, remain fixed when the whole of the weight has been taken off, which proves the danger of trusting to one seating. The valve which I have invented, and have been manufacturing lately, consists of three or more rings surmounted by the valve, which of course is equal in safety to that number of valves, at a very small additional expence; the same lever or weight, and spring answering for the whole. I feel convinced, that if manufacturers and others who are using bad water, are sensible of the risk they incur by trusting to one seating, they will gladly avail themselves of the advantage offered by my invention. The accompanying is an outline sketch of my compound safety-valve.

Fig. 1., A B C, are three separate rings, seated one on the other. A horizontal view of B is given at fig. 2. D is the weighted lever.

R. Crickwell.

Temple-street, London, June 29, 1840.

ON LATENT HEAT, CIRCULATION OF THE BLOOD, &c.—IN REPLY TO MR. G. A. WIGNEY.

Sir,—Several letters have appeared in the pages of your Magazine from the pen of Mr. G. A. Wigney, on the art of brewing, treated on scientific principles, in which is furnished a great deal of matter equally interesting and useful, especially to that class to which his remarks in particular appertain, and for whose reformation and introduction to the walks of science he expresses himself with equal acumen and good sense. In your number of June 6, I perceive he has entered the lists of discussion on higher ground, and, I am sorry to add, without being accompanied by the same correctness or intelligent principles. I feel it incumbent as a constant reader of your periodical to offer a few remarks on such portions of Mr. Wigney's communication as are calculated to mislead the public, as widely, I may venture to say, as the equally unfounded propositions of Mr. Prater, particularly as they relate to the first principles and groundwork of science, which cannot be held too clear and lucid before the public mind. Mr. Wigney's "Atomic Theory," set forth with such a learned array of abstruse expressions, differs in no one particular from what has been long before the public. But that latent heat is only made manifest by a "partial or total decomposition of a body or substance," I can in nowise subscribe to. Decomposition implies the chemical separation of the constituents of a compound body, but how many familiar instances are constantly occurring to common observation where the extrication of latent heat is exhibited without change in the substance which affords it, other than a diminution of bulk? A smith will hammer a cold piece of soft iron upon his anvil until it is heated sufficiently to ignite a match, and this takes place without any decomposition of the iron, merely because by violent compression its bulk is reduced, and so likewise its capacity for caloric diminished, a portion of that which existed within it being now set free. The appearances exhibited by "the particles of almost any powder when mixed with water in which they are insoluble," are to be attributed solely to the action of minute currents and disturbances in the water itself caused either by agitation or variation of temperature. Water scarcely ever contains any other free acid than the carbonic, and as chalk is composed of lime saturated with carbonic acid, no further action can take place from its presence. Muriatic and sulphuric acids also exist in spring or river waters, but always in combination either with lime or some other body for which they have an equal or a stronger chemical affinity. With respect to the ebullition of water in an exhausted receiver, Mr. Wigney has fallen into just such a mistake as he would, if he supposed his vat of boiling wort to derive its heat from contact with the surrounding atmosphere instead of the fire underneath it. There requires no instantaneous rush of caloric through the pores of the glass receiver to effect an evaporation of the water contained within it in the manner described, for as the experiment will only

succeed when the enclosed water has been previously raised to a certain temperature, it contains within itself that supply of caloric which, as Mr. Wigney correctly states, is necessary to the formation of elastic vapour. I will in as concise terms as possible, explain the manner in which this is effected. The boiling point of water is well known to be 212° Fahr. under ordinary atmospheric pressure, but in vacuo this is effected at as low a temperature as 90°, and consequently when a portion of water is first heated to 90°, and then placed under the exhausted receiver an immediate formation of aqueous vapour must necessarily take place, which in its violent escape not from the surface but from the interior of the fluid produces the usual appearance of ebullition. When the temperature of the water is reduced below the boiling point 90°, by the loss of a part of its free caloric which has entered into the formation of elastic vapour, the boiling ceases —by the same rule which governs it in atmospheric air when the boiling comes to an end if the temperature sinks below 212°, or in a "Papin's Digester," where it is subjected to very great compression, and ebullition does not commence until it reaches a temperature considerably above 400°.

A very slight knowledge of the anatomy of the heart would have enabled either Mr. Prater or Mr. Wigney to account for its action in propelling the blood through the human frame by a system more in accordance with the structural adaptation of means to the end. The blood on its passage is conveyed by the vena cava to the right ventricle of the heart, into which it flows till the cavity is filled, when the tendonous muscles with which it is furnished immediately by their contraction cause the ventricle to collapse and discharge its contents through the pulmonary artery to the lungs. Here the blood comes in contact with the atmospheric air, and after parting with the carbonaceous ingredients that give to venous blood its characteristic dark colour, is re-conveyed to the heart and enters the left ventricle at the moment when the tendons are slackened and the chamber becoming dilated for its reception. When this ventricle is filled, a repetition of the former action takes place by the foreshortening of the tendons, and the renovated blood is expelled through the aorta or main artery to be transmitted throughout the system for the exercise of its allotted functions. It clearly, I think, appears that no motive power is contained in the blood itself, but that it is mechanically forced through the ventricles of the heart, and from thence through the arterial system by the vibratory action of the nerves and tendons, endowed with the active principle of vitality from the Almighty Creator.

I am, Sir, your obedient servant,

A. Y.

Brighton, June 19, 1840.

BROWNE'S PATENT HYDRAULIC LEVEL.

This instrument, designed for ascertaining the relative heights of points not visible from each other, consists of lengths of water-tight flexible tubing, attached to each other by brass joints, and having glass vessels at each end. The vessels and tubing being nearly filled with water, the level of the water, as seen in these vessels at two points whose relative heights are to be compared, will serve to indicate their positions, whatever may be the inflexions of the tubing betwixt the two vessels. Graduated rods are placed perpendicularly at the points of observation, and the lower vessel is raised, and the higher lowered, until the level of the fluid therein intersects the graduation of the rods. It is conceived that this level may be peculiarly useful in mines and excavations, and in fixing complicated machinery.

THE "BRITISH QUEEN" VACUUM.

Sir,—In addition to the ingenious suggestion of "Momus" in your last week's Magazine, for graduating gauges for the patent condensers up to *thirty-six* inches, I would beg leave to hint that stereotyped or lithographed indicator diagrams should be kept ready "cut and dried" with proper spaces left for the insertion of date, weather, &c. This plan would save time, prevent mistakes, and perhaps be quite as useful, to the gullible portion of the public, as the system that seems to be pursued by Mr. Hall's advocates at present. Certainly, to those who occasionally peep behind the scenes in these days of steam-engine quackery, nothing can be worse managed on the

side of the partisans of surface condensation, than the display of diagrams at page 85. The paragraph signed "E. Peterson," under the diagram in the first column of that page, has evidently been misplaced, and belongs to the diagram in the second column. This diagram, which contains figures, is the one I shall notice at present.

Many of your readers will, of course, have observed that the figures in this diagram furnish us with a scale by which the vacuum in the cylinder may be exactly measured; this scale, in fact, is the same as Macnaught's, that is, one-tenth of an inch for each pound pressure per square inch, which being applied to the space between the atmospheric line and the bottom of the diagram, where the figures 18.7 are placed, it will be found to measure 13.4 per square inch, which is equivalent to a column of 27 inches of mercury; and this is the state of the vacuum in the cylinder *when at the best*, or when the piston is near the commencement of the stroke. But if we take the average vacuum throughout the stroke, it is found to be only 12.3 or about 25 inches of mercury. Thus the loss from imperfect vacuum, attending the use of Mr. Hall's system of condensation is, by his own advocates, shown to be equal to the force of ($30\frac{1}{2} - 25 =$) $5\frac{1}{2}$ inches of mercury, which is greater than is generally allowed in a good injection engine. Hence, all "Scalpel's" twaddle about the *slowness* of the process," is proved to be correct, by the very means brought forward to prove the contrary; and this "slowness" of effect, in surface condensation, has been long admitted both here and in Liverpool, by all who are practically acquainted with the subject, save only by a few, who are actually interested in the "slow coach," or otherwise connected with "slow coach" *makers*; or "slow process" *patentees*.

In conclusion, I may state that I happen to have long had in my possession the *actual* original indicator card (whereby there hangs a tale) taken from the *British Queen* engines on "Monday, 2nd September, 1839, at 12, noon"; therefore that of your correspondent Mr. Oldham can only be a copy, but which, so far as regards the diagram, I admit to be a correct one.

I am, Sir, yours, respectfully,

R. ARMSTRONG.

Manchester, July 9, 1840.

MR. HALL'S SYSTEM OF CONDENSATION.

Sir,—Owing to my having been out of town I have not till this day seen your Magazines of the 4th and 11th inst.

As "Scalpel" has (no doubt unintentionally) mixed up the merits and demerits of my Patent Condensers with the disputes between me and the St. George Steam Packet Company and their servants, I am sure you will do me the justice of inserting the explanation which I now send you.

The fact is this, I have been obliged to bring an action against the St. George Steam Packet Company, or rather against their chairman, William Heap Hutchinson, Esq., and their MANAGING director Joseph Robinson Pim, Esq., for between 4000*l*. and 5000*l*. for work and labouredone, and patent right also for damanges done to me by them and their servants, which I lay at 20,000*l*. I have now therefore only to beg of you and the public to suspend your judgement respecting the REAL causes of the Condensers being taken out of the *Juno*, *Vulture*, and *Sea Horse*, until my cause is brought into Court, which I pledge my word shall be effected with all possible speed. The evidence I shall then adduce respecting the tricks played upon my condensers in the St. George Steam Packet Compeny's vessels, will show them to be so extraordinary, that the statements would not be credited were they not given upon oath.

I will, however, in the mean time state one or two circumstances (which will then be proved) as an antidote to the mischief which might otherwise be previously inflicted upon me.

When the first large steamer, viz. the *Hercules*, to which engines with my condensers were applied, made her first voyage from Liverpool to Cork, William Ramsden, the managing engineer of the St. George Steam Packet Company, as well as Capt. Langlands, R.N., superintendent of the vessels of the same company went in her, and I went also to witness the performance of my condensers. After we had been some time at sea, Capt. Langlands and myself were surprised to find that the water in the boilers became salt, although that which passed to them through the air-pumps was perfectly fresh; we put into Waterford when the salt-

water was blown out of the bo lers and replaced with fresh water; on our then proceeding to Cork, the water again to our amazement became salt; when we arrived at that place, the boilers were a third time (after being blown off) filled with fresh water, under the superintendance of Capt. Langlands; but all this availed nothing, for shortly after we departed from Cork on our return to Liverpool, the same apparent witchcraft was repeated, and the water appeared to be again converted from its fresh state into salt water; but now mark the solution of the enigma; at three o'clock in the morning, Capt. Langlands came down to me in my berth and awaked me, when he informed me that he had discovered a most infamous conspiracy against me, for on going unexpectedly down into the engine-room, he had detected the engineers blowing the fresh water out of the boilers and pumping in salt water in lieu thereof. Capt. Langlands was so enraged at the discovery of this infamous conspiracy, that he had a violent quarrel with Ramsden, and at first had intended to order the engineers out of the engine-room, and confine them lest they should do any further mischief to the engines; however, I prevailed upon him not to do so, but to discharge them on our arrival at Liverpool, which was done accordingly; and on the matter being stated to Messrs. Hutchinson and Pim, they, at my request, discharged Ramsden from interfering any more with my condensers, and from coming in future on board the *Hercules* or any other vessel in which they were applied. It is scarcely necessary to state, that on the next voyage of the *Hercules* to Cork, and on all future ones after the discharge of Messrs. Ramsden and Co., no salt water ever found its way into the boilers, but the water was always found as fresh at the end of the voyages as at the commencement.

Soon after the above-mentioned occurrence, a circumstance took place which I will also relate to you previously to its being proved in Court. The Cork Steam Packet Company entered into a contract with me, for the application of my condensers to a pair of engines that were making for the *Juno* and the *Vulture*. Shortly afterwards, the St. George Steam Packet Compan bought these two vessels, and the directors of the Cork Company wished to transfer their contract with me, and of course their liability to pay me my patent right, to the St. George Steam Packet Company; but this I declined, at the same time, telling them that I would not have the transaction mixed up with my contract with the St. George Steam Packet Company, as I had no doubt but it would lead to disputes; after this refusal, I was requested to attend a meeting of the Cork Company Directors, when Mr. Beale, the resident director of the St. George Steam Packet Company at Cork, was present, and on his giving me in the presence of the gentlemen who attended the meeting, the most positive undertaking, that I should be paid separately for the *Juno* and the *Vulture*, and without in any way mixing them up with my contract with the St. George Steam Packet Company, I consented. What, then was my surprise, when on going to Liverpool to arrange the business with Mr. William Heap Hutchison, that gentleman attacked me in the most violent manner, and threatened to throw my condensers out of all their vessels, if I persisted in my demand of payment for the Cork Company's vessels, or even if I wrote to Mr. Bea e, to remonstrate with him against the gross breach of his agreement with me. Mr. Hutchison, when threatening to throw out my condensers, repeatedly, and exultingly, interlarded his threats with the question, *Will that serve you? will that serve you?* I replied no, but you are making use of your power to do me mischief in a very unfair and unjust way, for the purpose of compelling me to submit to a gross piece of oppression and injustice.

I then felt the full arbitrary power that Messrs. Hutchison and Pim had over me, and did not for a moment doubt that they would take out my condensers, to be revenged on me if I insisted upon my rights, no matter at what sacrifice of property it might be to the Company over which they preside and manage; I was therefore induced by prudential motives to let my claims respecting the above vessels, as well as all others remain in abeyance as a temporary matter. Those gentlemen, however, shortly after the above transaction unslipped, and again let Ramsden loose upon me, allowing all sorts of tricks (contrary to

my repeated remonstrances,) to be played by him and his underlings with my condensers, and Mr. Hutchison has put his threats in execution. I have, however, as already stated, commenced an action against them for the recovery of my rights and damages done to me. As to Mr. Hutchison's following up his threats, by taking out more of my condensers, nobody will be injured by his so doing, but the shareholders of the St. George Steam Packet Company; they, I admit, owe a debt of gratitude to him, and Messrs. Pim, and Ramsden. As to myself, I have nothing to fear from all those gentlemen can do to injure me, while I have such excellent specimens of my condensers in the most successful operation as those on board the *Albatross*,* the *Wilberforce*, the *Queen of the East*, the *Zenobia*, the *Megæra*, the *India*, and last, though not least, the *British Queen*. Of the many tricks played upon my condensers by Messrs. Ramsden and Co., I shall (previously to the trial) lay only one before you and the public; it has been a standing dish with them owing to its being of easy application, and an effectual means, if used extensively, of preventing my condensers from acting at all.

I have at all times forbid the use of anything but good oil to the internal parts of the engines through the stuffing boxes or otherwise, as the temperature to which I reduce the water resulting from the condensation of the steam would cause tallow to become solid. Notwithstanding, however, my constant protests against the internal use of tallow it has been used to such an extent that the condensing pipes have been filled with it like candle moulds.

I have a word or two to say about the *City of London* and the *Albatross*, but to prevent my letter becoming unreasonably long I will defer it to another opportunity, and will now trouble you only upon one more subject, for the information of the public and "Scalpel," upon a point respecting which, when touching upon it, he states as follows: "I have not sufficient acquaintance with chemistry to state positively," &c. He then intimates that the steam may, by impinging upon the copper pipes, "sweep off all oxidation." Whether "Scalpel" thinks he has found a mare's nest, and throws out this insinuation to injure me, or does it from any other more worthy motive it signifies not to me, I shall therefore content myself with giving such information as, I trust, will set the matter to rest.' Some years ago my brother, Doctor Marshall Hall, made a discovery respecting the oxidation of metals, which I believe was quite new; he proved that either pure water, without any admixture of air, or pure atmospheric air, without containing any portion of water, would not cause the oxidation of metals; if I recollect correctly he introduced thin plates of polished iron into bottles containing perfectly dry atmospheric air, and he put other similar plates into bottles containing distilled water, perfectly divested of any air; these bottles were carefully corked or sealed, and the plates contained in them continued perfectly bright, and were not in the least degree oxidated while the bottles remained corked, but as soon as they were uncorked the iron plates in both those containing air and those containing water became rapidly oxidated, for the bottled air attracted moisture from the atmosphere, and the bottled water soon became combined with a portion of atmospheric air. These experiments were published in some scientific work, but I cannot at this moment refer to them. Now, the inference to be drawn from the above facts is, that the copper pipes of my condensers cannot be liable to oxidation, if copper were even as liable to oxidation as iron, which is not the case, for none but pure distilled water, without any admixture of air (as in injection engines) ever goes into my condensers; this explanation will, I have no doubt, set the minds of my friends, if not of my opponents, perfectly at rest respecting this new *game* that has been put up. I know the sportsman and pack who started and are hunting it, which in due time I shall make public; that sportsman, however, is not "Scalpel."

Trusting to your sense of justice and impartiality for the insertion of this letter in your next magazine, I am, sir,

Your most obedient servant,

SAMUEL HALL.

Basford, near Nottingham, July 13, 1840.

* My condensers are not taken out of the *Albatross*, as stated by "Scalpel," but they continue, as they have done for years, to act in a manner the most satisfactory to the owners and all other parties.

Mr. Hall's System of Condensation.

Sir,—Moved thereto by the remarks with which you introduced the "Pioneer's" letter, I must admit that the tone of my former communication was not exactly that which it ought to have been. Scalpel, too, seems to have felt the implied censure, for he too admits that his former letter was "in a style unworthy of him, and assuredly unsuited for a mere scientific enquiry;" and his second composition, I am happy to see, is much less open to such charges. Messrs. Lloyd and Kingston are no longer accused of "arrogance," but are gently censured for "not having exercised that caution expected from their station." He assures us that he did not intend to express contempt for those who signed the "unexceptionable testimonials," whatever his words, rendered more emphatic by italics, might seem to imply; and he now exonerates Messrs. Pim, Twigg, and Beale, from the awful responsibility with which he before fixed them. Under these circumstances I think we may shake hands and cry "brother! brother! we are both in the wrong." It is true that he has somewhat marred his act of grace by exceptions, and that the benefits of the amnesty do not extend to all offenders. Mr. Peterson is still considered a coarse clown, "whose uncultivated palate is unable to appreciate" the delicate "Lafitte" of Scalpel's polished style, and therefore very properly to be "knocked down by strong drink," *i. e.* coarse language. He still manifests a desire to pluck my *rara avis*, (although I am happy to find he has not yet been able to snatch one feather from his wing as a trophy) and I am treated with cruel severity. As, however, I am not altogether annihilated, I shall venture a few remarks in reply, but (to avert Scalpel's wrath) endeavouring to observe a little more the *suaviter in modo*, which it must be confessed has been too much neglected on both sides.

I would, in the first place, suggest my doubts to Scalpel whether his account of the changes which have, from time to time, taken place in the modes of condensing the steam be quite correct. What authority has he for stating that Savery employed injection for that purpose, or that at the time when Watt commenced his improvements injection had fallen into disuse and been superseded by surface condensation? Smeaton, who was the greatest of Watts' immediate predecessors, employed injection, and so I think did Beighton and Brindley.

With respect to the charge of "misrepresentation," which alone it appears has drawn upon me the honour of Scalpel's notice, I think that, considering the determination apparent throughout Scalpel's letter, not to *judge* but to *condemn*, that I should have been excusable even had I omitted the alternative of "misapprehension." Scalpel, it is true, boasts in the outset of his second letter of the fairness with which he has acted to Mr. Hall in admitting the perfect efficiency of his apparatus as far as the prevention of deposit in the boilers is concerned, but this is not allowed to weigh in the scale against the assumed imperfections, and spite of his admissions he brands the invention as a "gross and costly delusion," and an unqualified piece of "quackery." Under these circumstances is it surprising that I should attribute to wilful misrepresentation the passage in which he gives your readers to understand that the space occupied by Mr. Hall's apparatus is in *addition to* that which the engines would require if fitted with the ordinary condensers. Scalpel appears to be thoroughly conversant with all the details of the engines, and we see by his last letter that he can give the dimensions of the parts to half an inch. He must therefore have known when he wrote the passage that the engines occupy not an inch more in length, breadth, or height than they would if they had not had Mr. Hall's condensers. I shall, however, be glad to find that the misrepresentation was not intentional, and that his words on this point as in some others convey a wrong impression of his meaning. As to the distance which the steam has to travel from the cylinder to the air-pump, and which he stated to be about three times as great as in ordinary engines, I should observe that in all engines the steam from the upper side of the piston must, before it reaches the air-pump, pass through a space equal to the perpendicular height of the cylinder above the bottom of the condenser, added to the horizontal distance between the two—that this distance in the *British Queen* is the same as it would have been with the ordinary condensers, and that the only difference in the two cases is, that the steam in ordinary engines would pass through the eduction channels in the slide case and enter the condenser at the lower part, whilst in Mr. Hall's the steam enters the condenser at the upper part and descends through the tubes of the condenser.

I think Scalpel acknowledges, in rather unkind terms, the opportunity I afforded him of setting himself right with your readers as to Newton's prediction, and (with permission be it said) I think there was nothing in the whole composition of his letter to lead us to infer that he meant anything but what he there said, and I have no doubt that the majority of your readers viewed the passage in the same light.

The main point in dispute, however, is whether, in consequence of the superior va-

cuum in Mr. Hall's condensers, there is an increase of power afforded to the engines. I agree with Scalpel that the barometer is not a conclusive test of the power exerted by the engine, but it is conclusive so far as the action of the engine depends upon the state of the vacuum in the condenser, and as Mr. Hall's claims to an increase of power rest solely upon the superior action of his condenser beyond that of the ordinary one, the barometer is the only test by which we can decide the relative efficiency of the two plans of condensation, and if he can show that he can produce a superior vacuum by his plan he establishes his claim, inasmuch as if the efficiency of the engine is not increased by such superior vacuum it must be owing to defective arrangement of parts to which Mr. Hall's improvements do not extend and for which he is not responsible. For this reason I regard the barometer as a fairer test of the effect of Mr. Hall's plan than the indicator, inasmuch as the vacuum shown by the diagram of the indicator will depend more or less upon the operation of the valves which form no part of Mr. Hall's invention.

To these remarks I imagine Scalpel will assent, provided that the vacuum at the junction of the condenser with the valve can be as perfect as in the lower chamber of the condenser which adjoins the air-pump; but he contends that this is not the case, and that whilst there is a very perfect vacuum in the lower chamber there is steam of considerable pressure in the upper one. In support of this opinion he brings forward arguments which, if he had advanced in his first paper, I should have endeavoured to meet by argument, but I am now able to reply more satisfactorily by a fact. M. Oldham, in your last number, states that in the *British Queen* there is an arrangement made by which the barometer may be connected with either the top or bottom chamber of the condenser, and that it has been ascertained by experiment that the vacuum in the upper chamber does not differ more than one-eighth of an inch from the vacuum in the lower chamber thus proving incontestably that a considerable increase of power is afforded to the engines in the *British Queen* by Mr. Hall's condensers.

There are some other parts of Scalpel's letter upon which I wished to remark, but I fear your readers' patience must be nearly exhausted by the length to which the discussion upon this subject has already extended, and that they are ready to reverse Macbeth's exclamation, and to cry "*blessed* be he that first says hold! enough!" Hoping, therefore, that Scalpel will, in his next, exchange his instrument for the tourniquet, with a view to stop the further effusion of *ink* in this cause, I, in compliance with his advice, abandon the *tomahawk* now and for ever, and sign myself,

Mr. Editor, your and his obt. servant,

T. Hawke.

Postscript, 13th July.—I greatly regret that in your editorial discretion you did not see fit to postpone Scalpel's last until my second one had appeared, as I think its deprecatory tone would have secured a pardon for my first offence, and have saved your readers from his last heavy visitation. If I formerly had broken his head, in my second letter I proffered a plaister, and renounced, at Scalpel's bidding, the use of the weapon which had inflicted the wound. From the continued outcry, however, which he makes I fear that the tomahawk has struck deeper than he would at first admit, although he gives sufficient evidence that it has not penetrated his *brain*. Still the wound might have healed had not Mr. Oldham given it a rub ere it was well skinned over, and thereby set it bleeding afresh. This wanton act of cruelty naturally suggests to "Scalpel" that it must be he who originally inflicted the wound, and that Oldham and "Tomahawk" are in fact "two single gentlemen rolled into one;" but if this is not the case he pronounces that they are *Arcades ambo*, and refers the reader to Byron for the *id est*. Leaving Mr. Oldham to disown, if he please, the *soft* impeachment, I shall only reply to what concerns "Tomahawk" as *one* of the *Arcades*.

"Scalpel," it appears, did himself an injustice when he said that his first letter was written "in a style *unworthy* of him," (however unfit it may be for a scientific enquiry); on the contrary it is worthy of him, and is natural to him, and I am happy to perceive, by his last, that his short-lived fit of penitence is over, and that he is himself again.

The fault which has called from "Scalpel" such severe castigation in his last is the style of my first letter, which shocks his classic taste. I will not pretend to dispute the justness of his criticism upon my irrelevances and redundancies, but methinks "a fellow feeling should have made him kind." Has he forgotten his own "purifying rivers, puny tapers, and glorious suns;" his "glimmering rushlights eclipsing the broad flood light of human knowledge;" his "mausoleums, pyramids," &c. He, like myself, is a bird fancier, keeping a *rara avis* and a glorious sea bird with clipt pinions, and might therefore pardon my *penchant* for the *corvis et columbis*. If I summoned "Zadig and Hermes" from "Babylon" I introduced them to the "chaste Donna Julia," whom "Scalpel" had brought from the banks of the Guadalquiver, and "Falstaff had fought for "Scalpel" "a full hour by Shrewsbury clock" ere he took the field on my side. In this last

instance, however, his anger is excusable; he first enlisted the fat knight, and honest Jack should not play "Jack on both sides." It is, however, for your readers to judge of our respective demerits. I therefore return to the main question, viz. the efficiency of condensation by surface. "Scalpel," it will be remembered, had in his first letter proved incontestably (in his own opinion at least), both by argument and jests (the latter no laughing matter), that there could be nothing approaching to a vacuum in the upper chamber of Mr. Hall's condensers, as the steam would "very cunningly refuse to come down until the portion at the bottom of the pipes is drawn away by the air-pump." It might be asked in reply, "how then is it possible for the condensation to take place during the descent of the air-pump when no exhaustion is going on? During this period a fresh cylinder full of steam is received into the condenser yet the gauge exhibits no variation in the vacuum, but according to "Scalpel" the vacuum remains steady at 30¼ inches. A more direct answer however is given by Mr. Oldham, who states that the gauge has been applied to the *upper* chamber, and shows that the pressure is the same above and below the pipes within one-eighth of an inch. Seeing his fine spun theory to be demolished by this fact if admitted, "Scalpel" is obliged to *assume* that the experiment has been unfairly made by merely opening the gauge cock for an instant previous to the termination of the up stroke of the air-pump. Mr. Oldham will doubtless feel called upon to settle this point.

If the losing advocate is, as "Scalpel" says, the first to lose his temper, I think "Scalpel" stands in that predicament. In the fulness of his wrath he now threatens, when time and place shall serve, to set aside Mr. Hall's patent as a punishment for the obstinacy of his advocates. I hope, however, that as he is strong he will be merciful —"tis well to have a giant's strength but not to use it like a cruel giant." Let him rest content with having rescued Watt's fame from extinction, (alas poor Watt!!) without seeking to add to this achievement the annihilation of Mr. Hall, but rather allow his invention quietly to sink into that oblivion which he assures us will in a few years be its fate. T. HAWKE.

Note from "Scalpel" in Explanation.

Sir,—A sentence in my last [p. 106, 23d line, first column], beginning "S. has judiciously pointed out," &c. has, I find, given rise to an opinion that "Scalpel" considers such plan better evidence than the indicator of what passes in the cylinder. Though no such inference can, in reason, be drawn from either observation, I prefer removing the erroneous impression through your pages. I spoke of the two gauges simply as a means "to enable *the time of both* vacuums to be noted," as an answer to Mr. Oldham's inconclusive fact of *one* gauge being connected with the top and bottom of the condenser, and to rebut the inference he sought to create by the assertion that the vacuum was nearly as good at the one part as at the other, omitting the time, when, &c. The indicator, that beautiful and simple little tell-tale of its giant companion, and sufficient of itself to rescue from oblivion the name of its illustrious inventor, is the only safe guide of effective power I am acquainted with. The scientific engineer is as well aware of this fact as that the gross pressure given by it in your last number is no evidence of the rapid and complete exhaustion of the cylinder. I presume not to write for scientific men but for the public. I therefore avail myself of this opportunity to make a general remark on the indicator that may not be found useless in practice. In the hands of a competent and honest engineer, it is, in connection with other data, the only sure detector of false facts, and the only safe criterion of real power; but like all exact instruments it admits of great facility of tampering with it in its first adjustment to a scale, subsequently by weakening its spring, and even if fairly adjusted, of erroneous results. I doubt the correctness even of the gross pressure given in the diagram referred to. My reasons would be too lengthy to explain. It is but a mere opinion, without inference, that such pressure was not fairly obtained. If accurate, however, it proves nothing for the rapidity of condensation insisted upon, whilst unexplained it remains, as before observed, the best confirmation of my argument. I did not expect so happy an illustration from an opponent.

I am, Sir, your very obt. servant,

"SCALPEL."

14th July, 1840.

IRISH SLATE.

We have hitherto derived nearly the whole supply of that useful article slate, both for writing and architectural purposes, from Bangor, North Wales.

The Irish slate, obtained from the Glandore Quarries in the county of Cork, has been long known and highly esteemed in the country of which it is the produce, but it is only now for the first time brought into the English market.

Specimens of the Glandore slate have

undergone a careful examination by Dr. Ure, and by Mr. Maugham of the Polytechnic Institution, with a view critically to test its fitness for the several purposes to which slate is usually applied. The results of these investigations show, that in point of strength—in its capability of resisting moisture—as well as in its power of enduring sudden changes of temperature—it is fully equal to the best Bangor slate: while in colour it is decidedly superior to it.

The Irish slate has also a little advantage in point of weight, its specific gravity being 2,865; while that of Welch slate is 2,785. Its most important recommendation, however, is that of being considerably cheaper.

The Glandore slate has been seen by several of the most eminent architects and builders, who have pronounced it of excellent quality, and in every respect equal to any hitherto brought into this market. They have also expressed their intention to introduce it most extensively in public and private buildings.

We are induced to remark that its more general employment within doors, for stairs &c. would be highly advantageous, and go a very great way towards diminshing those dreadful calamities, which continually result from the highly combustible character of our present dwelling houses.

A judicious introduction of *slate*, and the employment of the admirable *cement* for plastering, manufactured by the Fire-preventive Company, would, without any perceptible additional expense, ensure, that consummation most devoutly to be wished,—a *fire-proof dwelling*.

ON GAMBOGE, AS A PIGMENT.—FROM A PAPER READ BEFORE THE POLYTECHNIC SOCIETY OF LIVERPOOL, ON THE 11TH OF JUNE, 1840, BY MR. H. DIRCKS.

Gamboge, as imported into this country, from the East Indies, is usually in fragments, cakes, or short rolls; this latter form it derives from being cast in reeds, such as the bamboo. Though a vegetable product, it is not well ascertained either from what tree it is obtained, or the precise mode of procuring it; whether by incision, pressure, or by natural exultation. It is a gum resin, and, in its dry state, it is of a dark orange colour throughout, moderately heavy, breaking readily, with a glossy, and somewhat resinous fracture. It often appears in masses, produced by smaller pieces which have conglomerated simply by the influence of a warm atmosphere. Pieces of gamboge are found to vary considerably in clearness and purity, some having a darker, greener shade than others, and some, too, breaking with a shorter, glossy fracture, displaying a shining red resinous appearance.

As a pigment, gamboge is of some durability in water colours. It is also employed medicinally, being found to act as a powerful drastic cathartic. Its chymical composition has been variously stated attributable to the presence of a variable quantity of its principal constituents, the gum and resin, or foreign vegetable matter. According to Braconnot, there is, in 100 parts, 20 of gum to 80 of resin, that is as 1 to 4. In the British Annals of Medicine, Dr. Christison* gives the following result of his analysis of three varieties.

	Cake.		Lump		Coarse.	
	1	2	1	2	1	2
Resin …	74 2	71 6	64 3	65 0	61 4	35 0
Arabian..	21 8	24	20 7	19 7	17 2	14 2
Moisture	4 8	4 8	4	4 2	7 2	10 6
Liguin..	trace	trace	4 4	6 2	7 8	22
Starch..	——	——	6 2	5	7 8	19 0
	100 8	100 4	99 6	100 1	101 4	100 8

Dr. Thomson alludes to its being dissolved in alkalies, and being converted, by nitric acid, into a yellowish, bitter matter; likewise, that chlorine deprives it of its dark colour, a combination taking place between it and muriatic acid, which latter it neutralises.

In its dry, solid state, though of a very dark colour, it soon shows a pale, yellow tint when dipped in water, in which, when ground fine, it affords a turbid lemon yellow emulsion. In this aqueous preparation, it is long before any portion of the gamboge subsides; indeed, no absolute colouring matter is deposited, even when only a few grains are diffused through a quart of water. When the emulsion is of a creamy consistence, if a drop of this be allowed to fall on the surface of water in a tall, cylindrical glass vessel, it will, from its viscid nature, occasion a beautiful appearance in its descent, not unlike an inverted flower stem.

Gamboge dissolves readily in spirits of wine (not alcohol, as is generally stated), affording a bright, deep orange red tincture, which gives to paper a yellow stain. Applied dry to hot marble, gamboge has been found to impart to it a clear, yellow colour.

A substance is known to artists, called "extract of gamboge;" this is nothing more than gamboge precipitated from its spirituous

* See Thomson's Organic Chymistry.

solution, by adding a little water. If too much water is added to the saturated spirituous solution, the action of the spirits of wine is overpowered, and the common watery emulsion is formed. When carefully managed, an opaque yellow precipitate ensues, which must be allowed to settle; it will then be requisite to draw off the supernatant liquor, and, with a spatula, to remove the stratum of greenish gum above the gamboge, from which, when freed, there is obtained a powder much lighter in colour than the original gamboge, capable of being prepared in oil as a glazing colour. This method is that usually recommended and adopted.

Another process, and one which I have found to be expeditious and certain, may be conducted as follows:—

Prepare a mixture of gamboge in water; add strong liquor of ammonia, or caustic soda in solution; do this gradually, shaking the mixture each time till the whole changes from a turbid yellow to a beautiful rose red colour. If an acid be now added, precipitation takes place; pour in muriatic acid at intervals, until the red colour disappears, and is replaced by a curdy, yellow precipitate; now wash in plenty of water, collecting the precipitate on a filter of bibulous paper.

Heated on glass, over a spirit lamp, gamboge melts, swells, and carbonises. If heated without burning it does not lose its property of dissolving, by either spirits of wine or alkalies. A piece of glass made hot, then rubbed over with a stick of gamboge, acquires a thin, transparent coating of a golden yellow colour. It dissolves by heat in spirits of turpentine very partially; but the tincture gives a peculiarly equable yellow stain to paper. Boiling in plain water has no effect on gamboge; the addition of alum, with a little sulphuric acid to the hot liquor, occasions a partial precipitate in a few days. Gamboge certainly does not contain any colouring matter obtainable apart from gum or resin. The precipitate, however obtained, is no more than a deeply-coloured resin, and being such, its value as an oil-colour is exceedingly doubtful. Field, in his Chromatography, speaking of this interesting substance, observes,—"Sir Joshua Reynolds and Wilson are said to have employed it, and so, also we know, did the amiable President, West; the first of these used it softened into a paste with water, and the latter in a dry state, precipitated upon whitening. It has also been employed as a yellow lake, prepared upon an aluminous base; but a much better way than either is, to dissolve it into a paste in water, mix it with lemon-yellow, with which pigment being diffused it goes readily into oil or varnish." And again, treating of his lemon yellow, prepared from platina (but latterly from barium), he says, "In water it exceeds gamboge in brightness, and in mixture therewith improves its beauty. The mixture, also, goes readily into oil; indeed, it is the best and easiest way of rendering gamboge diffusible as an oil-colour—simple solution of the gamboge in little water, and trituration of the lemon-yellow therewith, being all that is requisite for this purpose." In his remarks on white lead he states it to have an injurious effect on gamboge.

We have thus briefly detailed the nature and properties of this curious gum-resin, as far as is at present known. With the artist it is an object to render it miscible in oil, which, without preparation, is not easily effected. Some doubt its permanence, attributing to it a liability to darken, like the original substance, to an orange tint; but we have seen it unaffected in the admirable works of Wilson. It is a substance of no other very extensive use in the arts beyond being sometimes used in lacquering, and by gilders, in colouring their size.

THE EXPERIMENTAL VOYAGE OF THE STEAM-SHIP "ARCHIMEDES."

[Abridged from the *Newcastle Journal*, July 11.]

This vessel, which is making an experimental trip round the Island, for the purpose of testing the practicability of a new method of applying steam to the propelling of vessels through water, arrived in this port (Newcastle) on Thursday week from Leith, and sailed on Saturday for Hull. She attracted considerable attention during the short time she remained here, and previous to her departure a number of scientific and commercial gentlemen were invited to inspect her. In external appearance, this vessel does not differ materially from an ordinary sailing vessel, except in having a funnel or chimney a-mid-ship, to carry off the smoke from the steam-engine. She is a smart craft, and independently of the great scientific improvement she is intended to illustrate, was much admired.

Amongst the individuals on board the *Archimedes* on Saturday, we observed the Mayor of Newcastle; Nicholas Wood, Esq., the celebrated engineer; Robt. Hawthorn, Esq., of the eminent firm of Robt. and Wm. Hawthorn, engine builders of this town; Wm. Cargill, Esq.; Capt. Palmer; Mr. Justice Nichol; Wm. Richmond, Esq., and a great number of scientific, commercial, and nautical gentlemen, all of whom inspected the works very minutely, and appeared to take great interest in the experiment. The *Archimedes* got under weigh a little before

high water, and the *London Merchant* hove out nearly at the same time, when the former took the lead, and kept it in gallant style all the way down the river. The Tyne bridge, the various craft moored in the river, and the banks on each side were crowded with spectators. On reaching Whitehill Point the *London Merchant* diminished her speed, and brought up opposite the New Quay, but the *Archimedes* proceeded straight over the bar; and when fairly out to sea the whole party, consisting of about eighty individuals, were invited to partake of an excellent lunch which had been prepared. The vessel "lay too" whilst this was going forward, and on our return on deck, the *London Merchant* was coming gallantly up upon the weather quarter, when the "Archimedean screw" was put into operation, and again for nearly a quarter of a mile we kept her in our wake. We then brought up, and the whole party were put on board the *Cupid* steamer, which had been engaged by the Trinity House to bring us back. This being safely accomplished, the *Archimedes* sailed round the *Cupid*, reversed her motion, and performed several other manœuvres, all of which were greatly admired. She then fired a salute, and took her departure for Hull, three hearty cheers having bee given from the *Cupid* and returned by the captain and crew of the *Archimedes*. Every one present expressed his delight at the success of the experiment, and gratification which the trip had afforded, and particularly to Captain Chapple, R.N., and Mr. Smith, the inventor, for their attention and courteous and gentlemanly bearing towards the party.

As a document of some interest we subjoin a tabular statement of the performances of the *Archimedes* during her experimental trip round the Island.

Voyages.	*Miles.*	*Time.*	*Remarks.*
The Nore to Portsmouth	165	21h. 55m.	
Portsmouth to Southampton	15	2 0	(Adopted)
Southampton to Portsmouth	15	2 0	
Portsmouth to Plymouth	130	16 5	
Plymouth to Falmouth	40	4 41	
Falmouth to Bristol	190	23 50	
Bristol to Tenby	77	12 45	
Tenby to Pembroke	30	2 45	Tide included.
Pembroke to Liverpool	200	19 30	
Liverpool to Douglas	70	7 40	
Douglas to Greenock	135	15 30	
Greenock to Campbeltown	65	7 15	
Campbeltown to Fort William	132	13 10	
Fort William to Inverness through the Caledonian Canal	60	14 30	About 20 Locks included, for which 6h. 25m. deduct.
Inverness to Aberdeen	124	13 45	
Aberdeen to Leith	87	10 0	
Leith to Tynemouth	104	13 9	
Tynemouth to Hull	133	15 55	
	1772	216h. 25m.	
Deduct		6 25	For the Locks.
		210 hours.	

Thus the *Archimedes* has sailed 1,772 miles in 210 hours, being on an average about 8½ miles per hour, in all weathers and states of the tide. Nothing can be more satisfactory than this. We almost forgot to notice the superior manner in which the *Archimedes*, to use a nautical phrase, "answers her helm," and which has been practically exemplified during the course of the voyage. In this respect she is under complete com.uand. In putting her about, the water thrown off from the propeller impinges upon the rudder with such force as to cause her to turn in little more than her own length. The nation is under deep obligations to Mr. Smith for the invention, and it is to be hoped that he will meet with a suitable reward.

The *Archimedes* arrived at Blackwall on Tuesday July 7, at half past eight o'clock, P.M., from Hull in 29 hours, having contended with a perfect gale of wind and a heavy sea, which, for the last 24 hours, was directly a-head. The *Monarch*, a larger and more powerful vessel, left Hull an hour and a quarter later, and arrived about 2 o'clock on Wednesday morning, being 34 hours on the passage, under the same circumstances of wind and sea, which at times flew completely over the top of the funnel of the *Archimedes*, thus showing the superior qualities of vessels fitted with the screw propeller.

THE "RUBY" *versus* THE "FIRE-KING."

A letter appeared in the *Nautical Magazine* for June last, signed "A. Billings, manager of the Diamond Steam Packet Company," in which he offered to match the *Ruby* to run from Gravesend to Margate and back, for 200 guineas against *any boat afloat*, whatever may be her size, power, or build!

This challenge was immediately accepted through Mr. Roney, the manager of the Polytechnic Institution, by Mr. Alexander Gordon, for Mr. R. Napier's *Fire-King* of 663 tons burthen, and with 57½ inch cylinders, low pressure; the conditions being "to run on a certain day, three weeks notice to be given, to deposit 200 guineas each, the course to be from Gravesend round a boat moored off Margate Wood Pier, time of starting to be named at once, and to take all chances of weather, sails to be used or not as the challenger pleases."

Mr. A. Billings, however, has "backed out," by stating that, "his challenge was published when the *Ruby* was lying up in dock,* that at the present time the season is at its height, and the *Ruby* could not be spared off her station just now."

That the "Diamond Company" might well be afraid to run their only crack boat against so formidable an opponent as the *Fire-King* will be seen by the following account of the *Fire King's* rate of steaming, as ascertained on the Gare Loch last October, in presence of Mr. John Wood, the well-known ship-builder; Mr. Lloyd, the assistant surveyor of steam-machinery of the Navy; Mr. J. Scott Russell; Mr. Robert Napier, and Mr. Alexander Gordon.

	min.	sec.	miles.
No. 1 a measured mile	4	9	14.45
2	3	43	16.14
3	3	58	15.13
4	4	13	14.22
5	4	5	14.69
6	3	42	16.21
7	3	57	15.19
8	4	16	14.06
			8)120.09
Average per hour			15.01

The miles were measured by three different and distinct parties, and the times taken by each individually. The *Fire-King's* measurements are as follow:—

	Feet.	In.
Length over stem and sternposts aloft	180	5
Do. of keel and fore rake	175	6
Breadth between paddles	28	0½
Depth in engine room	16	8½

Being 663 tons O.M.

The *Fire-King*, however, is not the only vessel waiting for an opportunity to *take the shine* out of the *Ruby*. The *Eclipse*, noticed at page 110, is said to be able to beat her by nearly two miles an hour. Truly the name of *Na-pier* will be enough to make the *Ruby change colour!*

* The incorrectness of this statement will be apparent on reference to our 874th No., May 9, wherein Mr. A. Billings states, "the *Ruby* had commenced running for the fourth season." The challenge appeared June 1.

COMMON ROAD STEAM CARRIAGES.

Sir,—In your number, 843, Mr. Hancock's steam carriage journey to Cambridge is narrated in a praiseworthy candid manner, from which it appears that "on a level road the greatest speed obtained was twenty-five miles per hour; but in ascending Wade's Mill Hill, *the full power of the engine was, of course, exerted*, and the force of the steam loosened the packing of the stuffing boxes; a segment also of the ring of lead-packing between the flange of the cylinder and its cap was blown out."

Every one who has watched the attempts made with steam coaches, on common roads, since 1825, will remember that on a level road everything has gone pretty well; but the moment the road is bad, laid with gravel, or goes up hill, *the full power of the engines being, of course, exerted*, or in other words, the steam being raised from 275 to 3 or 400 degrees, this immense pressure, aided by the collisions so natural on common roads, has invariably been attended with injury to some part of the engine. (We insinuate not by this reflection that any danger of explosion can arise in steam coaches on common roads, even if the steam were raised above 500 degrees; the peculiar construction of the boilers makes them safe.)

Six weeks ago the *Globe* briefly related two trips made from Camberwell to Brighton by Mr. Hill's steam carriage; it appears that on nearly level roads it succeeded very well, but *when the full power of the engine had to be exerted*, the same cause produced the same effect as in former instances.

Now, Mr. Editor, I beg leave to ask, as all the attempts made since 1825 prove, that raising the steam from 275 to 3 or 400 degrees, on a common road, (where concussions already predispose to accidents) invariably injures the machinery, does not common sense indicate that to bring steam coaches to run well and regularly, this evil ought to be remedied?

Is it impossible to conceive that with nearly an equal pressure of steam (say from 275 to 330 degrees, or in general terms, so high as experience will prove the pressure of steam

can be brought without inconvenience), a steam coach would run on gravel roads, or up hills, without injuring its machinery, if everything required to attain that end, prescribed by so long an experience, was done? now we propose it, although we are perfectly aware, *much more power is required under such circumstances* than when running on a good level road.

By some alterations in the actual arrangements of the engines, I believe it fully practicable, with a uniform steam pressure, to attain the required power for going up hills, and have less straining in the descent than by the present plan, which experience so often castigates.

The foregoing trips prove that, if England was a level country, as flat as Holland, long ere this hundreds of steam coaches would have covered the common roads, and run regularly at fifteen or twenty miles per hour. To do so in this country the above question ought (as it appears to me) to be solved satisfactorily, and I will communicate my solution of it to any person disposed to bring it in operation, but if you would lay this matter before your readers it may, perhaps, lead others to throw a better light on this important subject.*

I remain, Sir, your most obt. servant,
A. GORDON.

4, Jewin Crescent, 30th June, 1840.

RECENT AMERICAN PATENTS.

[*Selected from the Franklin Journal.*]

A CHAIR FOR RAILROADS, *Moncure Robinson.*—This invention consists in providing a chair having a shoulder on one side only, with holes or openings to receive screw bolts, which are to pass also through similar holes or openings in the ends of the rails; the holes or openings in the rails being sufficiently long to afford the requisite play for expansion and contraction of the rails in all changes of temperature.

Claim.—What I claim as my invention is the plan of attaching the ends of rails to chairs by screw bolts passing through openings in the rails, leaving open the chair on one side, and giving a shoulder to the opposite side, whereby the rail is thoroughly supported against the lateral action of engines and cars, and at the same time the means are afforded of placing and forcing the rails in line as described.

IMPROVEMENTS IN MANY CHAMBERED FIRE ARMS.—The claim made is to a block or nut, for filling part of the space occupied by the longer cylinder, and fitting the gun to receive a rifle barrel and a shorter cylinder. The whole object of the patent is to enable the owner of the gun to substitute a rifle barrel for one of a smooth bore, the other parts of the gun remaining as before.

ASCENDING INCLINED PLANES ON RAILROADS, *Davis H. Dotterer, and Thomas Jackson.*—The mode of ascending proposed by the patentees requires the use of a rack-rail in the centre of the track. The shaft which carries the cog wheel that gears into the rack, has on its ends two flanched wheels, which run upon the rails when the locomotive is ascending an inclined plane, but are raised from their bearing, by a suitable contrivance, when not so employed, the cog wheel being at the same time disengaged from the rack. The two wheels last spoken of are denominated power wheels, they are smaller than the ordinary driving wheels, and of such diameter as to prevent the teeth of the cog wheel from bottoming in the rack. They are driven by connecting rods from the driving wheels, which then act as fly wheels, being raised above the rails.

Claim.—The locating of the two wheels, which we have denominated flanched power wheels, in the rear of the locomotive engine, behind the ordinary driving wheels, providing the means of raising and lowering such wheels so as to bring a cog wheel affixed on the centre of the same axle into gear with a rack rail, and to raise the driving wheels clear of the track, for the purpose of enabling such locomotive with the train attached to it, to ascend inclined planes by the operation of the ordinary power of the engine.

There is considerable skill displayed in the plan devised by these patentees, but we apprehend that the objections to the employment of rack wheels on inclined planes are too serious to admit of their adoption.

A MACHINE FOR CUTTING SHINGLES, *J. Hinman, J. Thatcher, and A. Palmer.*—This invention is said to consist in making shingles from timber in its natural state, by cutting them longitudinal from the bolts, or blocks, of the requisite length for the shingles, by a reciprocating knife, placed obliquely, or at right angles, with the slide, or carriage, to which it is attached, operating parallel or nearly so, with grain of timber, according to the angle of the knife.

The claims made are to the carriage, or table, constructed with two moveable platforms at the upper side, placed at opposite ends, with their sides depressed as much as to give the requisite thickness and taper to the shingles, the opposite platforms having their opposite sides reversed, in combination with the two edged knife, as set forth.

* We would refer our correspondent to a paper on this subject at page 69 of our 32nd volume.—Ed. M. M.

A SMUT MACHINE, *William C. Grimes.*—This machine consists mainly of two vertical cylinders, the innermost revolving within the outer cylinder, or case, as in many other machines for the same purpose; there is, however, a strong characteristic difference from others in the arrangement of the acting parts; among these is the causing "a current of air to pass upwards between the two cylinders, with a degree of force sufficient to carry off all the foreign matter through an opening left for that purpose in the upper part of the machine, whilst the cleansed grain, from its superior gravity, descends and passes out at the bottom of the apparatus. The claim is to the manner of producing a strong upward current of air; the devices for which would require the drawings, or a more lengthened description than we can afford for their explanation. There are some other claims which are in the same predicament, we therefore dismiss the subject with observing that we have heard a very good character of this machine given by those who have made trial of it.

A THRASHING AND HULLING MACHINE, *Thomas Elliot.*—This machine is said to be for "thrashing all kinds of small grain, for shelling corn, hulling clover seed, and for cutting straw." As may well be supposed, some parts of the machine must be removed and others substituted for them, to adapt it to the various purposes to which it is to be applied. The specification is necessarily one of great length, referring to the respective parts in the drawings. The claims refer to the different devices employed, and we shall therefore omit them, as not aiding in the description. Whether the changes to be made are such as still leave the machine in possession of the character of individuality, may admit of some doubt; the law gives a patent for any new machine; but there have been many cases in which a patent has been refused where such a change was proposed to be made in a machine as would constitute it, essentially, another machine, applicable to a new purpose; such it seems was not the judgment of the office in the case before us.

A MACHINE FOR SHELLING CORN, *W. McElroy, junior, and B. and W. Boon.*—This machine is, in its general construction, similar to that first invented and patented for shelling corn; the effect being produced by feeding the corn between a revolving cylinder set with teeth, and a concave which in part surrounds the cylinder. There are, however, some new devices employed, in the particular manner of constructing the concave, and regulating its yielding, so as to adapt itself to ears of different sizes. The concave is denominated a "back," and the claim is to "the mode described of sustaining and regulating the self-acting back, by the combined action of the straps, &c., and the lower spring, or springs."

GLASSES AND FRAMES FOR SPECTACLES, *Charles L. H. Jackson.*—The patentee states that the object of his invention is "to protect the eye from too strong a light as much as possible; and this I effect by leaving only a small portion of the surface of the glasses polished, and surround it with a ground space extending to the circumference or outside rim, intending to obstruct the passage of the rays of light and soften their effects upon the eye, leaving that portion opposite to the pupil a small, clear, circular space." The bridge, and other parts, are to be so modified as to keep the spectacles steadily in place, as but a small portion of the glass is used for vision; the claims are to the preparing of the glasses and of the frames in the manner described.

The convenience or inconvenience resulting from the use of glasses thus prepared, and the effects they will produce upon the eye, must be determined by experience alone; our own impressions are that they will be found liable to objections which will prevent their general use.

NOTES AND NOTICES.

Discovery of the Antarctic Continent.—An interesting rather than important geographical discovery has this year been made in the southern Antarctic ocean, of an island or continent with a coast of 1,700 miles from east to west, but situated so far to the south as 64 to 66 deg.; it will be unavailable for tillage or settlement, though highly useful for seal and whale fishery. The most singular coincidence is, that it was discovered by the French and Americans on the same day, January 19, 1840, at the distance of 720 miles from each other. By reference to the map, it will be seen the above discoveries are in the longitude of New South Wales, and a continuation most probably of the same continent; for a series of large islands was discovered in 1830 by Mr John Briscoe, of the navy, who, when commanding the brig *Tula*, on a sealing voyage, fell in with the land in lat. 67, long. 50, (that of the Mauritius), and coasted it for 300 miles. He was also driven off by severe weather and icebergs.—*Sydney Herald.*

The Trafalgar.—The interest which vessels of the magnitude of the *Trafalgar*, at present building in Woolwich dock-yard, excite in the minds of the public is such, that a correct account of her dimensions must prove acceptable:—Length of gun deck, 205 feet 6 inches; keel for tonnage, 170 feet 6 inches; breadth extreme, 54 feet 7 inches; breadth moulded, 53 feet 9 inches; depth of hold, 23 feet 2 inches; burden, 2,702 tons. She will be launched in February, 1841.

The Iron Duke.—This vessel lately launched is the first iron ship built on the Clyde. For model and symmetry it may vie with any vessel built on the Clyde. The figure-head is a full length of the Duke of Wellington, in his field-marshal's uniform, and is a good likeness. The following are the dimensions:—Length, 103 feet; breadth of beam, 27 feet; depth of hold, 16 feet; register tonnage, 390; burden from 600 to 700 tons The *Iron Duke* is intended for the East India trade.—*The Surveyor.*

Navigation of the Liffey.—We perceive by the Irish newspapers that our friend Mr. Steele is about to publish a letter to General Sir John Burgoyne, developing, from some engineering elements perhaps not heretofore observed, a plan for opening water communication from the heart of the city of Dublin, through the delightful scenery of the valley of the Liffey, towards Lucan.

Caoutchouc Gun Boat.—A notice appeared at page 160 of our last volume, of the launch of an India-rubber boat on the Neva, at St. Petersburgh. From the *American Repertory* we learn that, at a recent fair of the New York Mechanics' Institute, at Castle Garden, an India-rubber cloth batteau was floated on the Hudson, opposite the garden, which attracted great attention; it contained fifty men and a twenty-four pounder, with which several salutes were fired, the water being at the time very rough, without at all injuring the batteau. The apparatus was extremely portable, and could be packed in a box three feet long, eighteen inches deep, and twelve inches wide.

The Peru.—On Wednesday week the *Peru*, one of the vessels belonging to the Pacific Steam Navigation Company, started from Blackwall down the river and back. She is a very splendid steamer of 700 tons burthen; her engines of 90 horse power each, are by Messrs. Miller and Ravenhill, and Oram's patent fuel is used in lieu of coal; she is fitted with Capt. Smith's paddle-box boats (described in *Mech. Mag.*, No. 843.) The company on board the *Peru* on this experimental trip consisted of nearly 200 ladies and gentlemen, who were entertained with an elegant *dejeuner a la fourchette* during the trip. On the return to Blackwall, the efficacy of the safety-boats was exemplified; they were lowered by slings into the water in less than four minutes, and the company conveyed by them to the shore; they are 27 feet long and 10 feet 2 inches in the beam. Their appearance adds to the elegance of the steamer, they take up less room than the boxes which usually cover the paddles, and as they are more snug, so they hold less wind, and consequently occasion less resistance to the speed and management of the vessel This adaptation has been made use of in the royal navy, and found to answer all the purposes intended by the inventor, but it has never been employed in mercantile steamers until on board the *Chili* (which belongs to this Company) and the *Peru*, both built by Messrs. Curling and Young. Both these vessels will touch at Rio and proceed through the straits of Magellan; their arrival in the Pacific Ocean will be an era in the history of Steam Navigation.—Abridged from *the Times.*

New mode of Propelling Steam Boats.—Falkirk, July 7.—An ingenious mechanic, residing at Grahamstone, has been for a long period engaged in constructing a small vessel to be propelled by means of pressure pumps—the application of a principle quite new to the masters of this science. On Monday evening the boat was launched into the Forth and Clyde canal, at Bainsford-bridge, and proceeded beautifully along the reach at a rate of not less than 15 miles per hour, conducted alone by the inventor, who worked the pumps. This novel invention has produced much speculation among the members of the profession in this place, and it is now reported that he is so much satisfied with his first experiment, that another on a larger scale is forthwith to be undertaken, and a patent procured to protect the invention. He has no doubt that it will, at no distant èra, entirely supersede the present mode of propulsion by means of paddle-wheels.—*Times.*

Antediluvian Forest—Formation of Coal.—There has been discovered by the workmen employed in cutting out the new road leading to the Norham-bridge, on the north side of the Tweed, a number of fossil trees. They appear to be of great antiquity, and do most beautifully illustrate the formation of coal from the remains of vegetable matter, bein for the most part incrustated with that substance, and some of it being of the purest kind. The stones are all lying in a horizontal position, and from 10 to 20 feet from the surface. The roots of the trunk cannot be perfectly traced, but the evident appearance of the lamina and of the branches completely establish their character. The trunks vary in size, but the largest appear to be about five or six feet in diameter. Several gentlemen in the neighbourhood have received specimens of what we have every reason to believe has been an antediluvian forest. A number of fossil trunks are yet *in situ*, and may be viewed by any naturalist desirous to see them.—*Berwick Warder.*

Nitrate of Soda as Manure.—This substance is, as its name implies, a compound of nitric acid and soda, and in many respects similar to common nitre (nitre of potassa). It has been chiefly procured from Hindostan, where it is found in extensive natural beds. In the spring it was sold at 18*s.* per cwt., but it has now reached 22*s.*, and even in some places, we believe a higher figure. It is sown by the hand, early in spring, at the rate of a hundred-weight to the acre; and as yet it has only been applied to grass lands, and, in a few cases, to oats. Although in a crystallized state, the crystals are very small, and in colour and appearance they very much resemble dirty herring salt. From its metallic base and large proportion of oxygen, the nitrate of soda weighs well to its bulk, and indeed a couple of hundred weights may be put in a common wheel-barrow. It has thus the advantage of being very portable. When sown upon grass lands its effects are said to be most rapid. Where tried the rest of the field has been either left untouched or manured with bones or lime, and within a few days the land which had received the quickening influences of the Eastern manure took a start in vegetation, which it has fairly kept ever since. Where bones are used top-dressing, cattle cannot be induced for long after to touch the grass, but the application of nitrate of soda is said to have no such effect. The powerful acid which enters into its composition appears to be an effectual extirpator of grubs, snails and other ground insects, the source of so much annoyance and loss to the farmer. Like other salts the nitrate of soda is a powerful agent in attracting moisture from the air, and the grass upon which it is sown has been observed to be "impearled with dew" when other fields were hard and dry. Probably this curious fact may have had no small influence in stimulating vegetation in such a season of drought as the present. These are the qualities ascribed to this manure, the most important of which is undoubtedly its power of producing food for stock early in spring. An extensive trial of it will be necessary before any proper judgment can be pronounced. It is as yet unknown whether its effects are lasting, and until this, of itself, is ascertained, caution must be used. It may be easily adulterated, but of course this will not be got over by tests; a simple one will be to apply a red hot cinder to a small quantity, which, if pure, will give off oxygen so rapidly as to produce, almost instantaneously, a full combustion.—*Dumfries Courier.*

The Chimney Sweeping Abomination.—It was a clumsy and cruel contrivance of the Romans to use hedge-hogs for clothes-brushes, and prepare them for it by starving them to death; our method of sweeping chimnies is not more ingenious and little less inhuman.—*Southey.*

Fire-proof Linen, &c.—A correspondent (F. R. S. Edin.) wishes to know "what is the best liquid to render linen, &c. incombustible by simple immersion and drying?"

Another correspondent (J. P. S.) inquires if there is any means known "for rendering canvass impervious to the weather, retaining its original lightness and softness, so as to fold without breaking?"

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Mechanics' Magazine,

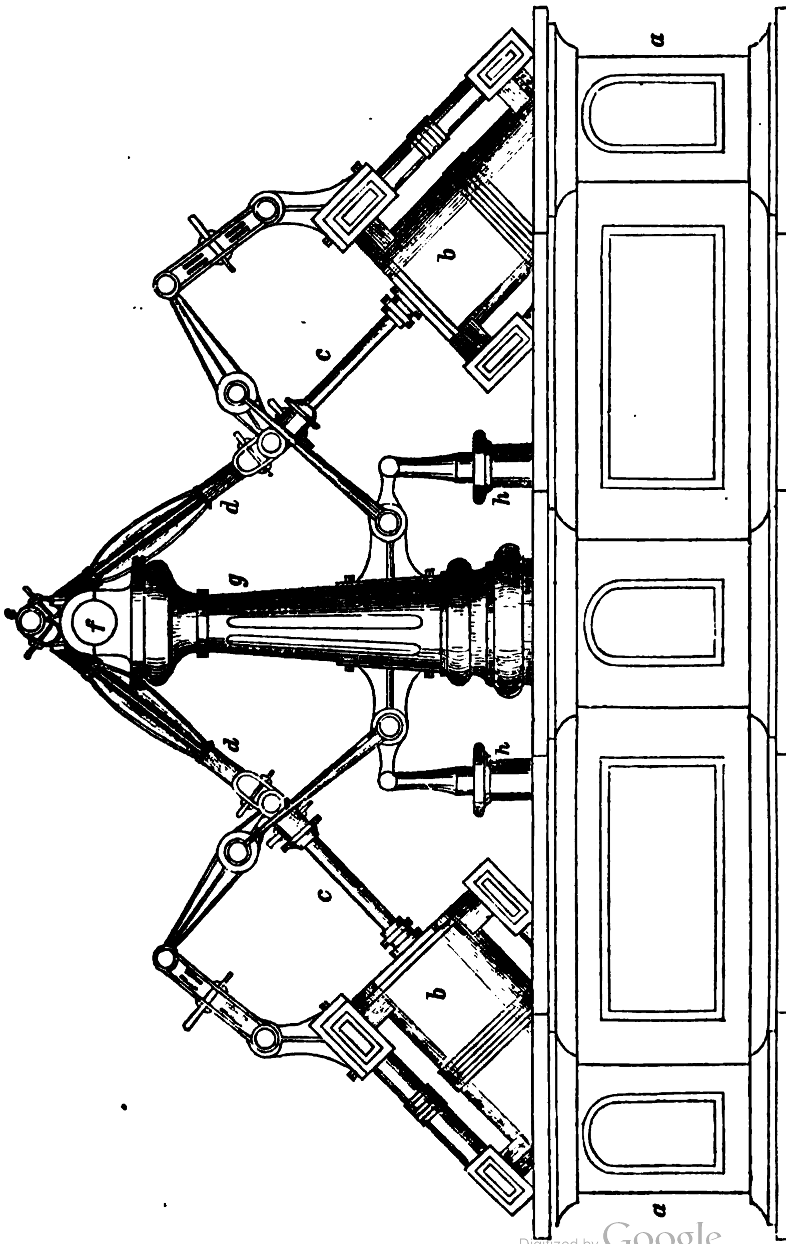
MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 885.] SATURDAY, JULY 25, 1840. [Price 3*d*.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

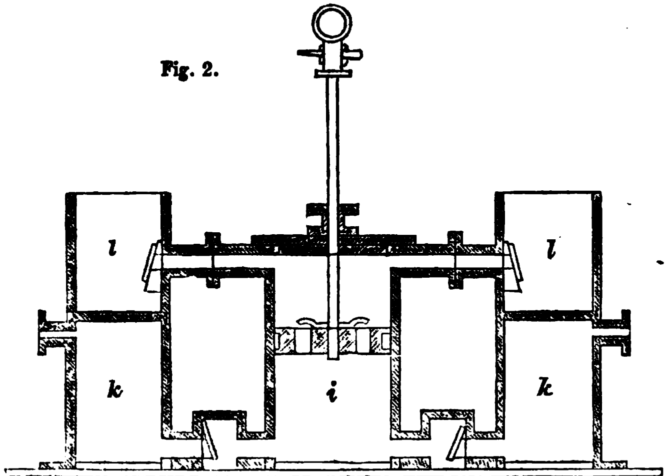
WHITWORTH'S DOUBLE ACTING STEAM-ENGINE.

Fig. 1.



WHITWORTH'S DOUBLE ACTING STEAM-ENGINE.

Fig. 2.



Sir,—Inclosed are two drawings of a double acting steam-engine, which I think may be applied to steam navigation with advantage, as it takes up considerably less room than those at present in use. It is upon a principle on which I have thought much, at the same time I must state that I am not in this line of business further than making miniature engines for experiment and amusement. If you think my plan possesses sufficient merit to make it worth publishing in your Magazine, I shall feel obliged by your so doing.

I remain, Sir, yours, &c.

THOS. WHITWORTH.

Royton, near Manchester, May 8, 1840.

Description of Engravings.

Fig. 1 is a side elevation; *a a*, a strong cast iron frame, within which the engine is placed, and to which its parts are firmly united; this frame is constructed so as to serve occasionally as a cistern for the reception of a quantity of pure or distilled water to supply the demands caused by leakage, should Mr. Hall's condensers be applied; *b b*, the steam cylinders; *c c*, piston rods; *d d*, connecting rods; *e*, crank; *f*, crank shaft mounted on two columns, *g g*; (only one is shown in the drawing); *h h*, warm water or boiler pumps which are worked by the bridle-rod shaft of the parallel motion.

The manner of admitting the steam above and below the pistons, is by a new arrangement of sliding valves, similar to those patented by Messrs. Seawards, of which a good description is given in No. 760 of your Magazine. I claim no originality on my part in respect to these sliding valves, only so far as to employ them here to show the superiority I consider they possess over any other sliding valves hitherto invented. Having a tendency to lie flat on their working faces by their own gravity, they continue steam tight without the aid of packing, or that of steam to keep them so.

Fig. 2 is a vertical section of the air pump and condensers as placed within the frame *a a*, fig. 1; *i*, the air pump; *k k*, condensers; *l l*, warm water cisterns and the boiler pumps falling immediately into them.

THE "FIRE-KING CHALLENGE."—TRIAL OF SPEED BETWEEN THE "RUBY" AND THE "GLOW-WORM" STEAMERS.

Sir,—I have taken the liberty of inclosing you a few remarks on the letter of Mr. Alexander Gordon, which has recently been published in several of the public journals,* concerning the *Ruby* steam-vessel, as I think that such un-

* The substance of which appeared in our last number, vide page 141.

just inferences as those contained in his letter ought not to be permitted to pass unnoticed. I would remark that my only inducement for taking upon myself to comment on his letter is, the great admiration I feel for that vessel and her fine qualities, and I regret that some person more competent has not thought it worthy to reply to that strange epistle.

It would seem from the framing of Mr. Alexander Gordon's letter, that the name of the *Fire-King* has quite scared Mr. Billings, and that he wishes to evade the proposed match altogether; and thereupon Mr. Alexander Gordon proceeds to congratulate himself and his employers on the imaginary triumphs he has achieved.

If, as Mr. Alexander Gordon would make it appear, Mr. Billings is afraid to run the *Ruby* with the *Fire King*, why do not the owners of the latter vessel bring her to London and go a passage with the *Ruby*, or any of the first-rate Thames boats, and by this means incontestibly demonstrate her superiority? —but we shall find that they will do no such thing, and it is my belief that after the race which I shall presently describe, there is small reason to expect that they will permit the *Fire King* of 240 horses power to run with the *Ruby* of 100 horses power, on any terms whatever, or even to come into the Thames at all.

On Thursday, July 16th, a vessel called the *Glow-Worm*, of 180 horses power, reputed in Scotland as the fastest vessel afloat, the property of Mr. Asheton Smith (who has spent a fortune in endeavouring to have the fastest vessel in the kingdom), and fitted by the same engineer as the *Fire King*, was brought out to try unexpectedly with the *Ruby*, after having been in dock to be cleaned up and put in her best trim. She went down to Gravesend in the afternoon, and having anchored off the Town pier, sent a challenge on board the *Ruby* to run from thence to London, when the latter should start with her passengers at six o'clock. About three minutes before six the *Glow-Worm* got under weigh, and at six o'clock the *Ruby* also started with 400 passengers and luggage on board, and proceeded after her opponent, who had got some distance a-head. It was quickly perceived that she was fast gaining on the celebrated *Glow-Worm*, and the captain of the latter vessel seeing that he would quickly be passed, commenced what in sporting parlance is styled jockeying, that is, alternately crossing and re-crossing before the bows of the *Ruby*, to prevent her going a-head, and by this manœuvre and the circumstance of some vessels obstructing the channel of the river, the *Ruby* was kept a-stern for some minutes; at length an opportunity presented in Northfleet Hope, where the vessels were separated by some colliers, they took different sides, and the *Ruby* immediately shot a-head, and continued to increase the distance over her rival in the most triumphant manner, and despite the delays which the stopping to land and take up several passengers occasioned, arrived at Blackwall nine minutes before the *Worm* passed, "dragging her slow length along."

It is thus apparent that the *Glow-Worm*, described as superior to her twin vessel, the *Fire King*, has sustained a most humiliating defeat, notwithstanding the north country tactics of her captain, and the possession of every advantage in preparation, and in cargo, and about double power of engines. That a very different result was expected there can exist no doubt, as the owner, Mr. Asheton Smith, was on board with a party of friends (including, no doubt, Mr. Alexander Gordon), who most probably were invited to witness the expected triumph over the *Ruby*.

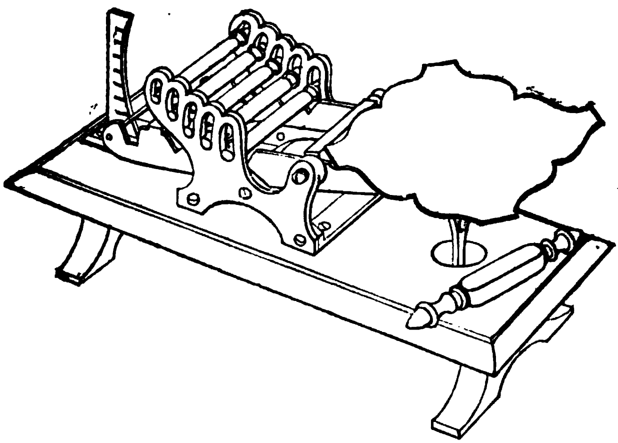
I cannot conceive for what purpose Mr. Alexander Gordon lugs into his letter the rate of the *Fire King's* steaming, and above all her dimensions, except it be for the purpose of doing that which he affects to condemn in Mr. Billings, *i. e.* puff. I think he presumes too much in fancying that the public will trouble themselves to peruse the rates per mile as measured on the Gare Loch, at which Mr. Alexander Gordon assisted,—but I should observe that it seems she never went two miles alike, sometimes going 14 and sometimes 16 miles per hour, which is a most marvellous feat for the same vessel to perform in still water.

In conclusion, I must beg your correspondent not to halloo before he is out of the wood. I do not think that the terms of Mr. Billing's letter entitles him to assume that the match is de-

clined further than to the latter end of the season; and I feel confident that under any circumstances the *Ruby* is capable of beating the *Fire King* hollow, as easily as she has just beaten the sister vessel the *Glow-Worm*, if the owner should have any further "stomach for the fight."

I am, Sir,
Your obedient servant,
C. D.

WILLIS'S PATENT LETTER BALANCE.



The recent Post Office regulations having suggested a new problem in weighing machines, namely, to make them indicate rapidly and accurately, not exact weights, but the number of entire ounces next greater than the weight of the letter or packet—this desideratum has been attempted to be realised by numerous inventors. The plan adopted has in every case consisted in the employment of separate weights, so disposed as to be lifted or deposited in succession, each succeeding weight in its turn performing the office of a stop, compelling the index to move through definite steps, in conformity with the new postage regulations. Several contrivances for this purpose have been secured by their inventors under the Designs Registration Act. In one of these, constructed by Mr. Riddle, weights equivalent to one ounce each are deposited on a series of steps placed at short intervals one above the other on an upright pyramidal stem—a large ring beneath the lowest, suspended from the scale-beam, lifting them until the accumulated weight exceeds that of the letter, when the index shows the amount of postage to be paid in that case. Another machine, registered by Mr. C. Griffin, consists in a series of metal ring weights (segments of a sphere) rising one within the other, the lower edge of the one taking hold of the upper edge of the next, and so lifting it; each ring being equivalent to an ounce weight. The action of this letter-balance will be very well illustrated by referring to the engraving of Mr. Grey's letter-balance at page 75, which it greatly resembles. More recently, Mr. F. Gye has registered an instrument of this kind, in which three weights are suspended from the scale-beam by a brass chain, but seat themselves upon three rings placed at different heights so as to be moved in due order at proper intervals of time. This machine is objectionable, inasmuch as the links of the chain interfere with the distinct action of the weights, and it has no marked scale indicating the exact weight or rate of postage.

The principle upon which all these contrivances are based, however, is to a very considerable extent, *fallacious*. In weighing with an ordinary balance we know that equilibrium only obtains when the scale-beam hangs horizontally, and

that if it is deflected from the horizontal line, it is by the influence of some acting force; from this it might reasonably have been inferred that every portion of the angular deviation from the true level had some positive assignable value, and was equivalent to some easily ascertained weight. The operation of this universal law goes to defeat the intentions of the several inventors before alluded to; the result being, that these balances will *not* move in definite steps—will *not* go direct from weight to weight, but with letters slightly in excess or otherwise, will vibrate, and sometimes stop between the points marking the rates of postage. The greater the angle subtended—*i. e.* the greater the distance between the respective weights, the greater will be the want of certainty in action, and the matter will be rendered still worse if chains, &c., are present to increase the ambiguity of the indications.

From all this it also follows, that the smaller the angle subtended by the beam, the smaller will be the interference of the disturbing influence, for which reason the invention which we are about to describe surpasses all its rivals of the "jumping" class, the objection being therein reduced to a minimum. The invention to which we allude is the patent letter balance of Professor Willis, of Cambridge, one of which, manufactured by Messrs. Holtzapffel, and Co., is now before us. It consists of two levers or scale-beams framed together and supported upon knife-edges; at the one end is placed a scale-pan for the reception of letters, &c., to be weighed. The other end of the levers is notched for the purpose of taking up alternately five cylindrical bar-weights which lie in a rack just above the lever at a slight inclination from the horizon, so as to be lifted by the levers in regular succession. At the extreme end of the levers there is an index-wire pointing to an upright index or graduated scale, upon which the rates of postage are distinctly marked. When at rest the index-wire points to 1d. and the lever is weighted so as not to rise unless the letter weighs more than half an ounce, in which case the lever rises up against the first weight, the index pointing to 2d. If the letter slightly exceeds one ounce, the first weight is lifted and the lever stopped by the second, and 4d. is pointed to upon the scale. The scale extends to 5 ounces, *i. e.*, 10d. postage; if a letter exceeds that limit, a supplementary weight is placed in the notches at the end of the lever, and 10d. has to be added to the rate of postage indicated by the machine.*

The scale-pan is kept horizontal by a parallel motion, consisting of a radial lever concealed below the stand, which is jointed to a continuation downwards of the stem which carries the scale-pan.

Appended to the directions for use, is the following, which forms an apology for a defect, hardly admitted in the principle on which this machine is constructed, but which applies with greater force to the objections urged against some of its predecessors:—

"The packet should be placed gently in the scale to reduce *the oscillations which are inseparable from all well-constructed weighing machines*; or the balance may be held down by the index wire, and gradually relieved after the letter is deposited, which will entirely prevent the vibrations, and prove the most rapid way of employing the instrument."

The instrument before us reflects great credit on the inventor for its ingenuity and simplicity, as well as on the manufacturers for the very beautiful manner in which it has been got up. In our opinion it realises to the utmost practical extent, the principle of action upon which it is founded.

PADDLE-WHEEL *versus* THE SCREW—TRIAL OF STRENGTH.

[For the *Mechanics' Magazine*.]

A few days ago the following experiment was made in the river, to test the power of the Archimedean screw as compared with the common paddle-wheel, in the presence of Mr. Fawcett, the eminent steam-engine builder, of Liverpool; Mr. Barnes, and other gentlemen. The *Archimedes*, with Mr. Smith's screw propeller, and the *William Gunston*, tug-boat, with common paddle-wheels, were lashed together, stern to stern, but with an interval between them of from 20 to 30 feet. The former vessel has two en-

* In using the additional weight, it must be remembered that there is no such postage as elevenpence: and, therefore, if the index should rest at the lowest mark, or at the second, the postage, in both cases, will be one shilling.

gines of 25 horses power each; the latter two of 20. The *Archimedes* was first employed to tow the *William Gunston* with her engines and paddle-wheels in a state of rest, and this she did with ease; the object of making this preliminary trial being to ascertain that the working efficiency of the screw was not impaired by the relative positions of the two vessels. The steam was then let on to the engines of the *William Gunston*, and a fair trial of strength commenced between them. In a little while the *Archimedes* was seen to have lost all power over her rival—a minute or two more and the *William Gunston* was tugging the *Archimedes* after her, in spite of the superior engine-power employed in the opposite direction, and in spite also of the aid of her much-lauded screw propeller—at first slowly and, as it were, intermittingly, but at a constantly increasing rate of speed, till at last it reached the usual tug-boat speed of from 8 to 9 knots an hour.

M.

G. D. DEMPSEY'S SPRING-SOCKET FOR CANDLESTICKS, &c.

[Registered pursuant to Act of Parliament, June 22, 1840.]

Fig. 1.

Fig. 2.

Fig. 5.

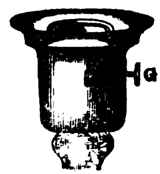


Fig. 3.

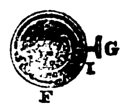
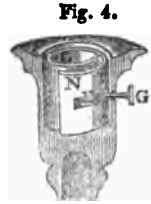


Fig. 4.



This invention consists in the application of a spring or springs made of metal or any other material, to candlesticks, candelabra, and sockets of every description, intended for holding or supporting candles; so as to hold and support the candle in an erect position without the necessity for using paper, &c. to wedge it in.

The kind of spring to be used is similar to watch-springs, and it should be so tempered as to retain the candle firmly without crushing or breaking it. The drawing shows two modes of applying the spring; one, exhibited in figs. 1 and 2, adapted for high or parlour candlesticks; and another, shown in figs. 3, 4, and 5, adapted for flat or chamber candlesticks, for the sockets of candelabra, &c.

In figs. 1 and 2, the spring A is shown

rivetted at B, to the socket of the candlestick, &c., or it may be fastened or attached to or held in the socket in any other manner, C, is an arm, bar, or crank, fixed to the rod D at one end, *a*, and at the other end, *b*, rivetted or otherwise attached to the interior end of the spring. Although the rod D may be placed in the centre of the socket, it is preferable to place it a little out of the centre, as shown in the drawing by which the end *b* of the crank, bar, or arm, C, in opening the spring is turned more closely to the outer end of the spring, and thus more effectually opens it. The rod D passes through two or more holes in the candlestick, as shown at *o* and *d*, to keep it in its position, and is turned and the spring thereby opened, by the handle, E.

By another mode of using the spring exhibited in figs. 3, 4, and 5, the rod and crank are dispensed with. The outer end of the spring is rivetted or otherwise fastened to the socket at F, and to the other end of the spring a handle or knob, G, is rivetted, or attached in any other convenient manner; the spring, as shown at H, figs. 3 and 4, and the socket, as shown at I, figs. 3 and 5, have slits or openings through which the shank or stem of the handle G is passed, in order to open the spring, as will be apparent from the drawing.

The manner of using these springs or spring-sockets will be obvious. According to the arrangement shown in figs. 1 and 2, the handle E is turned so as to open the spring, and held so while the candle is placed in the inner space, K; the handle E is then released and the spring immediately collapses, holding the candle firmly. By the method exhibited in figs. 3, 4, and 5, the handle G is turned so as to open the spring, and while held so, the candle is placed in the inner space L; the handle G being then released, the spring collapses and retains the candle firmly.

Among the advantages peculiarly possessed by this spring or spring-socket, it will be seen that the candle is held in a true perpendicular or upright position; that it is *instantly* secured or released; the trouble and inconvenience of wedging in pieces of paper, &c., avoided; while the candle may be safely and conveniently consumed to the last remnant, for when it is burnt down to the top edge of the spring, the spring may be opened, the candle raised and replaced in a higher position, while the spring will still secure it firmly, and thus dispense with the necessity both for save-alls and for slides or other apparatus for raising the candle. Still should it be deemed preferable, it is obvious that slides or sliders similar to those now commonly used in candlesticks may be applied to these springs or spring-sockets to work within them.

Only two modes of adapting the spring to the purpose named are here explained, the same principle may be applied in other ways; the invention consisting, as first stated, in the application of a spring or springs to candlesticks and sockets of every kind for holding and supporting candles in a more safe, easy, and commodious manner than is now in use.*

GEARY'S PATENT WOOD PAVING.

Wood paving will doubtless ere long be looked and acted upon in a national point of view, and in its sphere will render as much public convenience as either steam or gas, although its first introduction in the metropolis was considered more as a visionary experiment than as a practical principle of public improvement. Few persons even took the trouble of inquiring into its merits; but after various experiments had been made, which, to public amazement stood equally well the test of the summer's heat and winter's frost, the attention of scientific men was drawn to the subject, and the question only became, what form of block was most likely to answer the desired purpose?

We have already given a lengthened account of several of the patentee's inventions, and have now to notice that of Mr. Geary. This gentleman's professional knowledge as an architect and also from practical experience as surveyor for many years to several public paving boards, has naturally made him fully conversant with the best method for paving. His patent embraces about twenty different formed blocks for paving of streets, tram-roads,

* By a somewhat singular coincidence a contrivance for the same purpose has recently been patented in America, by Mr. Wm. Church, his brief, though comprehensive, claim being for "an elastic holder for the candle, connected to the socket, by whatever means, and however formed." ED. M. M.

and railways, including that now used by the Metropolitan Paving Company, which is a decided infringement on Mr. G.'s plan, his being a prior patent to that used by the company.

We consider the form designated the bevil shoulder block, superior to all others, and likely to come into general use; this plan possesses all the advantages of the Whitehall and Oxford-street paving, without the objection of pinning. These blocks are on a self-supporting principle, each resting on a shoulder, and cross jointed, thereby preventing either the rising or sinking of any block, still allowing each to be taken out with the greatest facility for repairing or laying the gas or water pipes. Another great advantage this plan possesses, is the introduction of a pyramid bearing block in every 10 or 12 feet, whereby the pressure is divided, and the paving formed into a succession of arches across the street, instead of one continued bearing-line from curb to curb, as adopted by the Metropolitan Paving Company.

This patent, we understand, has been purchased by the General Wood Paving Company, and arrangements are making for laying pavement on this principle on an extensive scale. We shall, in a future number, report on the progress made, considering the principle of this patent the most likely to answer the convenience of the public.

SUCCESSFUL EXPERIMENT WITH COL. MACERONE'S NEW STEAM CARRIAGE.

Sir,—Having been accustomed for many years to drive some of the best appointed fast coaches, I was invited to accompany a party of gentlemen on an experimental trip with Col. Macerone's steam locomotive carriage, intended for travelling on turnpike roads; on Wednesday morning last, it started from Mr. Beale's manufactory, East Greenwich, and proceeded through Lewisham to Bromley, a distance of 8 miles, performing the journey in the (almost) incredible short time of 28 minutes; we returned at about the same rate. So confident was Mr. Beale in the performance of the engine, that he was determined to try Blackheath-hill, which was ascended in gallant style, stopping half way up, when the steam was again applied she soon gained the top in a majestic manner; we proceeded over Blackheath to the top of Shooter's-hill, at the wonderful speed of 14 miles an hour, with 17 persons upon the carriage. At the Bull the men were regaled, and the boiler supplied with water, when we descended the hill, and arrived at the factory at a quick rate. Several shareholders who were present, expressed themselves highly delighted with the trip, and warmly eulogized the abilities and exertions of the scientific engineer.

C. HARBER.

London, July 20, 1840.

THE SANATORIUM.

We have perused with much gratification, a prospectus of "The Sanatorium,"—a self-supporting establishment for the lodging, nursing and cure, of sick persons of both sexes, in the middle classes of life.

The necessity for such an Institution arises out of the circumstances which remove persons of these classes from their families, obliging them to live in lodgings in London, away from their relations and friends,—a condition which deprives them in sickness, of the nursing and care ordinarily experienced by persons in their station.

The number of persons in this condition in the metropolis can hardly be apparent without some consideration. Many young people of both sexes come every year to London, for the purpose of completing their professional education, as students of medicine, of law, of the fine arts, or of general literature, &c. Most of these young people are not only removed to a distance from their homes, and located with strangers, but they lead a totally different course of life from that to which they have been accustomed—working harder, living more irregularly, and breathing a comparatively impure air; the consequence is, that they become more prone to disease, and it is a matter of experience, that many persons of this class perish every year from acute maladies, having no one to take proper care of them in their illness. A still larger class consists of young persons, who, having finished their education, settle in London, and commence the practice of their respective professions. At the commencement of their career, the largest portion of these persons live in lodgings,

and even those who reside with families, such as tutors, governesses, &c., do not properly constitute part of those families, and are not in general looked upon as proper objects of the care of the family, when incapacitated by sickness from discharging their duties.

Persons connected with the various branches of literature and science, are peculiarly solitary, and their mode of life is incompatible with the maintenance of health. They take little exercise, they are more than commonly inattentive to diet, they labour too intensely with the mind, without a sufficient variety of occupation—itself relaxation.

Clerks in counting-houses, banks, and government-offices, however happy their position so long as they preserve their health, are no better off than the preceding classes, when seized with sickness, being equally without a convenient chamber, and without a skilful or attentive nurse. The peculiar evil in the condition of all these persons, when attacked by serious disease, arises out of their solitary and isolated situation; there being no one to take charge of them, no one to minister to their wants at the very time when they require peculiar care. But families are occasionally placed under circumstances of equal distress. A child is seized with fever; the family are compelled to reside in a bad situation, in an inconvenient house where the separation of the sick from the other children is difficult, perhaps impossible; where the patient can neither be protected from noise, nor surrounded with pure air. Or, the head of such a family is himself attacked: there he must remain in a close and infected situation, full of malaria, probably the first cause of his malady; there being at present no establishment, to the salubrious, spacious, well-ventilated and quiet chamber of which he can be removed, and where, if desired, he may still be attended by his own physician, and nursed by members of his own family. The establishment now contemplated, is to consist of separate and private chambers, furnished with the accommodations appropriate to sickness; the rooms to be maintained of a uniform temperature day and night, forming an artificial climate fitted to prevent the development of latent disease, and to lessen, or ultimately remove the constitutional tendency to it. Nurses of a superior class will be engaged—the most skilful medical attendants obtained —and all those valuable aids to convalescence adopted, which the present improved state of science so abundantly furnishes.

The total expense to each patient is *not to exceed* two guineas per week, or as much less as may be found practicable. Every person who enters this establishment will pay for the services he receives, but the sum required from each will be so moderate, that its advantages will be placed within the reach of any one whose income is 100*l*. a year, affording him an amount of comfort, such as no isolated individual could procure for himself had he 1,000*l*. a year.

This institution, therefore, will be, in fact a club, the members of which mutually combine to secure to each other, at a moderate cost, advantages and comforts which, without such a combination they could not obtain at any price.

The subscription is one guinea per annum; the payment of ten guineas, constitutes a life member. The charge to members will be less than to non-subscribers, who will only be admitted on the recommendation of members.

MR. HALL'S CONDENSERS.

Sir,—I regret that Mr. Hall's not uninteresting letter did not appear earlier. There is something in the simple statement of wrong that comes home to the feelings of most men. I form no opinion of injustice upon the *ex parte* assertion of an interested party, but merely state that had the public known proceedings were pending, so far as "Scalpel" is concerned, Mr. Hall had never heard of the discussion. I am sure, too, you would not have allowed it. Through Mr. Hall's letter I learn for the first time, his disputes with the St. George's Company, and I am bound, in justice to the Directors, of whom I know not one, to assert their ignorance of the writer of these papers, and that in no way have they furnished him with facts or suggestions. I need not explain myself further, except by adding, that neither are any of those parties acquainted with "Scalpel's" identity. As regards the destruction of boilers by the oxidation of the copper, it was not necessary for Mr. Hall, in explaining its action, publicly to infer that it was an insinuation thrown out by "Scalpel" to his injury. Mr. Hall cannot in reason consider it improbable, that the

same consideration which led to other parts of those papers, might induce a suspicion that known laws might apply to his condensers. It has been long decided by experience, that copper and iron are their own destroyers when in contact exposed to the air. Well guided analogy, the only sure reasoning in the absence of facts, or to ascertain their correctness, could hardly fail to carry that knowledge a step further, and I regret that I see nothing in the experiments of Dr. Hall to remove an opinion strengthened by reflection, but it would be improper at this time to say more upon the point.

Had my papers originated with any of the parties mentioned in Mr. Hall's letter, or had they assisted me with information (which in truth I have made some persevering inquiries to get at correctly), with what decency could "Scalpel" ask the confidence of the public in his opinions? The mere prostituted writer of more despicable employers, seeking to prejudice a question the subject of an action, he must have felt a conscious weakness in a cause unworthy his efforts or his time. He also disclaims all previous knowledge, though not unmindful of its value, of Mr. Armstrong's confirmation of his theory. The resemblance of my note to his letter must have been remarked. In sending that note to the Editor, I worked out some figures respecting the diagram in reference to an injection engine of Mr. Watt's which bring the identity in the result still closer; but unable to procure a scale, I did not consider them sufficiently accurate for publication. I find so many practical engineers unacquainted with the indicator, and unable to understand the diagram referred to, that, if acceptable, I will forward a drawing with a popular description of the best kind.* Its general disuse in steamboats is some reproach to the engineering science of this country. Had it been, as it deserves to be, an inseparable part of the engine, we had not possessed so many certificates conveying erroneous inferences.

But now, since I can address Mr. Hall, let me ask him to consider dispassionately whether he can fairly complain of the discussion. Let him look how it begun, and with what provocation it was continued. Did he act wisely in permitting the insertion of what alone gave rise to it—Mr. Peterson's log? He will know the particular force and justice of the remark. I will not enlarge upon it. I was equally ignorant until the last (I think) of my papers, of the question to which that log may be considered as meant more particularly to apply. Further, was it no provocation "Scalpel" received to call for his last paper. Mr. Hall, who moves in polite society, cannot but be sensitive enough to the offensive public epithet, as inapplicable as uncalled for, from Mr. Oldham. Such license of the tongue in a periodical journal, called for the severest reprehension. "Tomahawk's" playful blows were as the tickling feather to his Irishman's shoulder in comparison. *Nemo me impune lacessit*, and so we are quits: it has now clean passed from my mind.

If I am correct in my opinion, that the *Mechanics' Magazine* is deprived of half its usefulness, unless open to advocate the cause of the mechanic and inventor against the frequent injustice and oppression of powerful companies, there are other parts of Mr. Hall's letter that are not undeserving of comment. If the design of the journal comprises the mere circulation of sound principles of knowledge, and meritorious inventions, and the industrious and persevering proprietors of the latter are not secured in their fair exercise, not merely by the law, but by the far more powerful voice of public opinion, little will be the use or value of inventions, or their publicity. Companies now are well nigh monopolizing the wealth and power of the country, and though they are fairly entitled to estimation for the wide channels they open for spirit and enterprise, they require from their great increase and wealth, vigilantly to be watched. They have the power of the giant, and too frequently use it with the brutal and inconsiderate ferocity of a drunken one. Though Mr. Hall has not done wisely perhaps at this time, to bring before the public, parties whose conduct he intends making the subject of legal inquiry, especially for so serious an amount, yet it may call for an observation that can in no way prejudice the question. With such disputes "Scalpel" has no concern, except as far as abuse of power by passing without censure, may become example for imitation. The Directors gave the best evidence of their abhorrence of the infamous conspiracy related by Mr. Hall, in discharging the perpetrator of as barefaced and shameless a fraud to injure the fame and property of an inventor, as was ever recorded. The injured individual cannot adequately deal with such persons. The press alone has sufficient power to mete out the punishment. In other respects, I form at present no opinion of the conduct of the company in question, but it is hoped they have not in truth done this grievous wrong to Mr. Hall. I protest I read his statement with regret, lest in ignorance of the question I had said what might prejudice it. It is, however, lamentably the case, that Directors sometimes forget their high station, and with

* We shall be glad to receive it.—Ed. M. M.

the tyranny and insolence of irresponsible power, frequently seen in public bodies, are content to divide among themselves the obloquy of injustice they dare not incur, at the risk of character, in their individual capacity.

"Meanness is a medal," it has been well observed, "whose reverse is insolence." Seldom separate when accompanied with the overbearing weight of the union of money and numbers, no equal chance has the unfortunate inventor, if he be the victim of private pique, prejudice, or rival interests. The law, it is true, is open to all, but, like the cruel mockery of a tavern to the starving, none can enter but the rich. When an inventor of what he deems an improvement in the useful arts, after all the wearying alternation of excitement and depression, and an outlay of capital which unreturned to him may sink his family in want and despair, becomes the ill-used victim of a capricious and despotic company, the public should exercise a wholesome spirit of reprisals, and estimate every Director of that Company, as if each had himself committed the wrong. Let the case be clearly proved, and let public opinion follow the verdict. Companies present too frequently the facilities of the dreaded "Lion's Mouth" in the olden time of Venice. The accuser safely indulges his malice, and remains secure in his power, whilst the unfortunate victim knows not his secret enemy until he sinks under his revenge. I do not apply these observations to the company in question, but the truth of their frequent application is too notorious to be denied. This case of Mr. Hall deserves watching. If, for matters independent of the merits of his invention, it has been removed from these vessels to raise an inference of its failure, the action is not alone the cause of Mr. Hall, but of the whole inventive talent of Great Britain, and he will have their sympathies, for his spirit in fighting their battle whilst he defends himself.

This is no inconsistency in "Scalpel." He is not one of that pack, who kept in order by the lash of the whipper-in of power, has pointed to him the object of revenge, and then cheered on to the destruction of the victim—

"The consequence is, being of no party,
I shall offend all parties:—never mind!
My words, at least, are more sincere and hearty,
Than if I sought to sail before the wind."

The public are not so concerned as they ought to be, at the decisions of invention upon such principles. It is one thing fairly and openly to decide upon their merits, in a journal where both sides have the same arena for discussion. On equal terms, truth alone decides the result. But the case now comes before the public on different grounds. Though the natural depravity of the human heart is increased, and ferments and corrupts more in the mass, there can remain no doubt, that if instances of oppression were more noticed, less cause of complaint would ensue. Through the press alone can this be done, and it is a mighty instrument of good, when guided by judgment in watching over the rights of its suiters in its particular department.

I must not part with my old friend "Tommy Hawk" without a word. I congratulate him on his new character, though he don't seem to know exactly how to act in it. He offers a letter of condolence in one hand, and his terrible weapon in the other. Melodrame the most affecting, or tragedy of the deepest horror! Why not content without that cruel postscript. How eagerly should I have accepted the proferred calumet of peace from one who knows so well how to touch the heart. Who could resist the pathetic appeal of "Brother! Brother!" It was really too much for me, too affecting, I must close the scene on this part of the exhibition, lest my feelings render me unable to bear his blows. As regards the periods of condensation and his concluding paragraph, I am not inclined to reply to, because I have no desire to "injure" an individual, which is equivalent to the regret that I may possess the power. Perhaps "we'll talk of that anon." I cannot agree with him in what he asks my assent to in the first column at p. 136. A little consideration and he will not agree with himself. As to the other parts of his letter he labours with so much zeal to prove how deep his "Tomahawk" has penetrated, that he will persuade no one. When the wound gapes we require no assurance of its existence. The gentleman, I am afraid, does himself an injustice in judging of the facility of breaking my head by the softness of his own. He is pleased to tell me that my last letter was worthy of me, and natural. Had he known the instance familiar to me, and its lamentable result, of a worthy person having lost many thousand pounds through such testimonials as I have deprecated, he would deem most "worthy" the style best adapted to prevent a similar recurrence. For the few individuals who may have considered that paper too severe, from not knowing its reference, double the number have felt its general and justifiable application. It is not one reader makes a Magazine. Others beside myself are indebted to the Editor for its insertion, and I can give no stronger evidence of the good sense of the notice to correspondents in the last No. on Editorial interference. As regards Mr. Watt, let it not be thought that "Scalpel" deemed it

necessary to vindicate *his* fame. He is content to be considered the mere broom worthy to sweep off the cobwebs from the statue which a grateful nation has erected to the greatest benefactor of his country.

Not applying the observation to any of your readers, we too frequently see the crawling things of an ephemeral existence seeking to obscure the fairest monuments of genius, and though we know them indestructible, an admiring posterity prefer they should remain in all their original excellence. The admirers of Watt will forgive the feebleness of the attempt in the warmth and sincere admiration that proceeds from the heart, derived from no "morbid" source, but from a knowledge of his imperishable works, the greatest instance on record of successful philosophical research directed to the noblest ends.*

So much has been said upon the style suited to a scientific inquiry, that I request your indulgence for a general observation. I would say to those who object to the style of this correspondence, bear in mind the great variety of characters and dispositions who read this journal. I see it on the tables of clubs, and in the hands of the stoker. Few, if any periodical passes through more various classes. Variety then is desirable for contrast, and those who prefer their own beautiful compositions, as all do, ought to feel indebted to "Tomahawk" and "Scalpel" for the foil. Individuals who are neither engineer nor inventor, read the *Mechanics*, as the best publication of useful knowledge in its department, as a mere branch of general information on what is going on in the mechanical world. When such persons write in it, they naturally take a wider range than those who merely describe. Bear with it for its novelty, if not for its propriety. It is the exception, not the rule. The general reader too, will draw the proper distinction between distinct treatises of a class purely scientific, and the style more suited for a weekly periodical of miscellaneous information on such subjects. Not every one likes the mere drybones of mechanical detail, as disgusting to some as the skeleton, though equally useful. Were the world peopled with "living skeletons," how tired and weary would the eye wander for a contrast. I believe I speak the opinion of many sensible persons who read this journal, but if not, are there none who might not be attracted to the details of science if they found flowers covered its ruggedness? Why do we prefer the admirable Burke to all political writers? Because upon the driest details, even on statistics, his imagination and feeling give a charm as well as force to his truths, and draw you on almost against your will, in deep concern at by-gone events, the interest of which had long passed with the occasion, but for so wonderful a writer. Bacon, again, though quaint, is not devoid of imagery. Reader carry this opinion out, and you will see its force. I suggest it simply to those who have the power to create and to give a taste for a different style to the mere crude productions of detail, and *occasionally* to discourse "wisdom though steeped in fun."*

I had nearly forgotten to observe, that I beg Mr. Hawk will not put an inference upon my observations I really never intended, I did never consider, nor insinuate that Mr. Peterson was "a coarse clown." Private character I have not interfered with, but dealt with writers only as writers. Mr. Peterson, on the contrary, is essentially the gentleman in manners and in person, and equal to any of his class I have met with,—superior to most. I have received his courtesy and attention as a stranger, and take this opportunity of acknowledging both. "Scapel" thanks "Latent" for coming forward in support of the friend of Watt, Dr. Black, though time has not allowed for the consideration of his paper It is "by the conflict of opinion," Voltaire observes, "the truth is elicited." In return for Mr. Hawk's courtesy,

I remain, Sir, yours, and his,
Very obedient servant,
SCALPEL.

* I know not that it is necessary to explain my defence of Mr. Watt. It may not be generally known that the spirit of detraction (and a deep acquaintance with Mr. Watt's powers will best show with what truth) began with a *Reverend* gentleman whose name is well known, but which I need not again bring before the public. I have watched its point of starting and followed its orbit.

* Isaac Barrow.

ON THE COMPARATIVE ADVANTAGES OF LONG AND SHORT STROKES IN STEAM-ENGINES.

In our last volume some discussion took place upon the advantage of long and short strokes in steam-engines, without any very satisfactory conclusion being arrived at. We have now the pleasure of extracting the following excellent paper illustrative of this subject, from a very able pamphlet by Mr. John Seaward, C. E. (printed for private circulation only), in which this question is treated in all its bearings, with consummate skill and great practical acumen. We shall have the gratification of drawing further

upon this source in subsequent numbers, meanwhile we commend the present extract to the careful perusal of our readers :—

A popular notion has for a considerable time past prevailed, that a long stroke engine is much superior to a short stroke engine; and it will consequently be found that the practice of most, if not all engineers, is greatly regulated by this idea. On very careful consideration, however, it does not appear that this alleged superiority can be satisfactorily proved. That a long stroke engine, under certain circumstances, may be much more advantageously employed than a short one, is undoubtedly true, but considering the steam engine *per se*, that is, without reference to adventitious or extraneous circumstances, it would be difficult to show that the former has any advantage whatever over the latter.

For let a careful comparison be made of a long stroke engine with a short stroke engine; let there be two beam engines of thirty horses power each, both equally well made, but the one having a stroke of eight feet, while the stroke of the other is only four feet, the cylinder of the latter being double the area of that of the former; it being understood that both engines shall make the *same* number of revolutions per minute; the steam passages and valves to be of the same area and capacity; and the two engines in all other respects to be well proportioned and made without any limitation as to space or weight.

Now as regards the mere mechanical effect of the moving power (*i. e.* of the steam) it is perfectly clear that it must be precisely the same in both engines, because the same volume of steam must produce the same mechanical effect whether it is let into a long narrow cylinder or into a short wide one; therefore, if there be found any difference in the efficient duty or economical working of these two engines, that difference must arise from circumstances quite unconnected with the mechanical effect of the steam power.

The only circumstances which really can make any essential difference in the efficient duty or economical working of these two engines are these:—First, the greater or smaller quantity of friction in the various parts of the machines. Second, the greater or lesser radiation of heat from the cylinders and passages; third, the greater or smaller loss of steam by the clearance of the piston at the top and bottom of the cylinder. Fourth, the *inertia* and the impulse of the parts of the machine in motion on the surrounding air.

First, then, of the *friction*. It will be found in the working of a well made engine of the proportions of the short stroke engine under comparison, that more than four-fifths of the whole friction are due to the packings of the piston and air-pump bucket, and of the piston rod and bucket rod,* and less than one-fifth to the main gudgeons, the end gudgeons, the crank pin and other moving joints about the engine. But the friction of the piston packing will vary as the circumference of the piston, multiplied into the distance which the piston travels. Now in the long stroke engine the piston supposing it to be 30 inches diameter, will move eight feet, and the friction of the packing be therefore as 24, while in the short stroke engine the piston will be about 42.4 inches diameter, will move only four feet, while the friction of the packing will be only as 17. In the same way it can be shown that the friction caused by the packing of the air-pump bucket, of the piston rod, and of the bucket rod, is also respectively in the ratio of 24 to 17, in the two engines. With respect again to the friction due to the main and end gudgeons, &c., it is clear that it will be less in the long stroke engine, because in the latter engine the force acting upon these parts will be one-half what it is in the short stroke engine. Assuming therefore 100 to be the whole quantity of friction in an ordinary engine then, 80 of these parts in the short stroke engine will be due to the piston, air-pump, bucket, &c., while in the long stroke engines the friction of these parts will be as 113 that is $= \frac{24}{17} \times 80$, but the friction on the main and end gudgeons in the former engines will be as 20, and in the latter only 10, making the total friction in the short stroke engine 100, and in the long stroke engines 123, or one fourth more.

Second. The *radiation of heat* will be in proportion to the extent of surface, but the surface of the long stroke cylinder is much greater than that of the short cylinder, whence it follows that the loss by radiation in the former, must be greater than in the latter.

Third. The *clearance of the piston* at the top and bottom of the cylinder, which will evidently be greater in the short stroke engine than in the long stroke engine. Because the area of piston in the former is double that of the latter, some persons would be disposed to say that the loss by clearance in the former must be double what it is in the latter; but this is not quite certain, for it is not required to give so much clearance in a 4 feet stroke cylinder as it

* The friction of the slide is not included, as that will obviously be the same in both engines.

would be advisable to give in an 8 feet stroke cylinder, the reason of which is obviously that the spring and elasticity of the parts in the long stroke engine, must be much greater than in the short stroke engine, and that they must therefore require more clearance. However, it is probable that there would be more loss in the latter engine than in the former.

The loss of steam by filling the passages and nozzles, as also by the radiation of heat from those parts, must evidently be the same in both engines.

Fourth. *The inertia and impulse of the moving parts on the surrounding air.* The loss in a steam-engine occasioned by these two causes may not be very considerable; indeed as regards what is called the *inertia* of matter in the moving parts, it is doubtful whether any such source of loss really exists; however if it does exist, it is clear that the amount of loss must vary in proportion to the *momenta* of those parts of the machine which are in motion, but as the *momenta* must be as the mass of matter in motion multiplied by the velocity, and as these are evidently much greater in the long stroke than in the short stroke engines (because the parts in the former are, if anything, of greater weight than in the latter, and also move at a double velocity) it follows that whatever loss may arise from the *inertia* must be much greater (double ?) in the long stroke engine than in the short stroke engine. With regard to the loss occasioned by the impulse of the moving parts on the air; it must be admitted that in very slow motions it cannot be very important; nevertheless with a material increase of velocity this source of loss becomes serious; it varies as the extent of surface of the moving parts multiplied into the *square* of the velocity. It is tolerably manifest however that the surface of the moving parts in the long stroke engine will be, if anything, greater than in the short stroke engine, and that the velocity of the former will be twice that of the latter; therefore, the loss by impulse on the air in the long stroke engine, must be four times that in the short stroke engine.

Beside the foregoing causes, it is doubtful whether there are any others that can produce any material difference in the efficient duty or economical working of a steam-engine. at least none that can in any way influence the question now under consideration. In estimating, therefore, the advantages of the short and long stroke engines, we have in favour of the former a diminution of loss occasioned by friction, by radiation, by *inertia*, and by impulse on the air; while on the other hand, we have in favour of the long stroke engines a diminution of loss in the clearance of the piston at the top and bottom of the cylinder. It may be difficult to strike an exact balance between these several sources of loss; but there can be no doubt that in a steam-engine the loss by friction is much greater than the loss by all the other causes before mentioned put together; and it is past dispute that the balance of loss as regards these causes, is decidedly against the long stroke engine. (The advantages offered by the short stroke engine as regards diminution of space and weight, although of vast importance, are not here adverted to, because they form no part of the immediate inquiry.)

It may be objected that to select an engine with an 8 feet stroke and a cylinder of only 2½ feet diameter for comparison, is not a fair proceeding, because an engine of such proportions is unusual; and it may be also asked whether, if the principle is further extended by making the stroke only 2 feet, and again doubling the area of the piston, whether the advantage would still be in favour of the short stroke engine?

To this it may be answered that although an engine of 8 feet stroke and 2½ feet diameter of cylinder, may be unusual in this country, it is not so in America; in that part of the world many engines are employed of very nearly the above proportions for purposes of steam navigation; and in which engines it is not unusual for the piston to travel at the rate of 300 or 400 feet per minute. Again, as regards the carrying out of the principle by still further reducing the length of stroke, say to two feet, and increasing the diameter of cylinder proportionately, say to 5 feet; there is no doubt whatever that such an engine would have precisely the same mechanical effect as either of the other two; but the balance of advantages would be against an engine of such proportions, because it would be verging to an extreme on one side, as much as the 8 feet stroke engine may be thought extreme on the other side. It may, however, be safely affirmed that the principle applies most powerfully to the case where the diameter of cylinder is the same as the length of stroke, because in that case the proportions are most favourable for the diminution of friction and of radiation, and offer the minimum of disadvantage under the several heads of loss above enumerated.

As it is manifest, therefore, that in all particulars which more immediately affect the beneficial employment or working of a steam-engine, the long stroke has no manifest superiority over the short stroke; it may appear strange that so decided a preference should have hitherto been given to the former by the generality of engineers. Per-

haps this is chiefly to be attributed to the circumstance of the long stroke offering on most occasions greater convenience than a short stroke. Much may be due also to fashion. The earliest application of steam power was for the purpose of pumping water in the course of mining operations, and in this sort of work a good long stroke was found to be attended with considerable convenience and advantage. In blast engines, and many other of the earlier applications of steam power, the same result was manifest; the earlier habits and ideas of engineers were therefore naturally associated with long stroke engines. Moreover, the earlier manufacturers of steam-engines had neither good machinery nor good workmen; they could neither depend upon the correctness of their proportions nor upon the exactness of the workmanship; besides, timber and other inefficient materials were formerly employed to a considerable extent in the construction of engines; from all which causes, imperfections and irregularities were numerous in the earlier engines, and they were consequently very inefficient. As all these sources of imperfection and inefficiency operated much more extensively against short stroke engines than against long, it is no wonder that the latter soon obtained a preference, and that the prejudice should still continue to exist, notwithstanding the same causes are no longer in operation. At the present day, with our good materials and workmanship, exact proportions and adjustments, a short stroke engine will be found to work as accurately and as perfectly as a long stroke engine.

There is one very important circumstance to be kept in view as regards long and short stroke engines; which is, that whenever an engine of the latter description has hitherto been made, it has always been considered necessary to keep the cylinder nearly of the same diameter, as in the long stroke engine, and to cause the engine to make a greater number of revolutions in proportion to the shortness of the stroke, so that the piston in every case might travel at a nearly uniform speed of about 200 feet per minute. Now, to a short stroke engine, made on this plan, there may undoubtedly be many objections. The more frequent alternation of the stroke —the greater loss of steam by the more frequent filling of the passages and nozzles, and the clearance at the top and bottom of the cylinder—the much greater angular motion of all the bearings and moving joints, thereby materially increasing friction and wear—are all circumstances tending to lessen the efficiency of a short stroke engine made upon this plan. It is clear, however, that an engine made upon the principle hereinbefore laid down, is not open to the same objections.

And, as regards the speed of the piston in engines, whatever may be the length of stroke, being regulated to the uniform standard of about 200 feet per minute, there can be no valid reasons given for such rule; no one can prove that double the above speed, or only one-half that speed, might not be employed with equal or greater advantage; it is certain that in many steam-engines of the transatlantic world the pistons move at a speed of 300, 400, and even as much as 500 feet per minute, and no substantial reason can be alleged why such engines should not do good duty; indeed it may be safely affirmed, that whether the speed, of an engine be 100 feet, or 200 feet, or 300 feet per minute, it matters nothing; provided all the parts of the engines are well proportioned for the proposed speed, the efficient duty and economical use of the engine will be much the same: keeping this always in mind, that *the slow speed will be more favourable for the easy and pleasant working of the engine, and for durability.*

This question may however be asked—Since it is shown that the long stroke has no superiority over a short stroke, but on the contrary, that the balance of advantage is rather in favour of the latter, is it intended to recommend the invariable adoption of a short stroke engine to the total exclusion of a long stroke? By no means. All that is contended for is, that in every case a length of stroke should be adopted whether long or short that shall prove to be most convenient, and best adapted to the object for which the engines are to be employed; and that an engineer should not be fettered and cramped by any fallacious abstract notions, that what is termed a long stroke engine must necessarily be more efficient than an engine with a short stroke; and that he should not therefore be obliged to sacrifice many other far more important considerations, for the sake of obtaining in every case the longest possible stroke.

The application of steam power for the purpose of navigation has had such wonderful results, the character of the steam-engine has become so greatly changed, and the proportions so altered, that a marine engine of the present day and a land engine of former times can scarcely be recognised as belonging to the same class of machines. The length of stroke of marine engines is probably not more than half what used formerly to be given to engines of similar power for mining and manufacturing purposes, but still no one can say that this this departure from old rules and maxims has been attended with any disadvantage; on the contrary, it can be shown to have been most beneficial and glorious in its results; and if a still further departure from old established notions can be proved advantageous

for steam navigation, we have no reason whatever to regret the change.

There is no question that the ordinary beam engine as employed in steam vessels has proved most efficient, and that in its application it has been productive of vast benefit. If however, by a modification of the existing steam-engines, these benefits can be still further augmented, and that in an eminent degree, no consideration ought to stand in the way of the proposed improvements. The great and paramount objects to be aimed at in the construction of steam-engines for navigation, are the following, viz., the greatest saving of fuel, the greatest saving of space, the greatest saving of weight, and the greatest durability of the machinery. The more eminently the marine engine shall combine the above important qualities, the more nearly will it have arrived at perfection; and much as may be advanced in favour of the beam engines generally used for marine purposes, it cannot be considered presumptuous to declare that the system of engines employed in the *Cyclops* and *Gorgon* frigates, is far superior in all the qualities before enumerated.

It only remains to be stated, that the real question is, not whether the stroke of an engine shall be 8 feet or 4 feet; but relates to a difference of stroke of probably from 7 feet to 6 feet: that is, whether the reducing of the stroke of a 200 horse engine *one foot*, with a proportionate increase of diameter in the cylinder, can be attended with such injury and inefficiency as shall wholly neutralise or outweigh all the important advantages of the Gorgon engines.

In conclusion, it should be observed that as regards the ordinary beam engines, there are many circumstances of convenience which render it advisable to make the stroke as long as practicable, *i. e.*, the adopting a tall narrow cylinder instead of a short and wide cylinder; for in the arrangement of the ordinary beam engine for marine purposes, it is evident that a considerable space lengthways is required for conveniently placing the slide jackets and passages, the condenser, the hot-well, and the air-pump; this necessarily causes a great elongation of the side levers or beams; there is, therefore, much local convenience in making the stroke long, and thereby having a tall narrow cylinder instead of a short wide cylinder, less strain is thrown upon the beams; the beams become more close and compact, and afford more space for a passage between and on the off-sides of the pair of engines: the cross-heads and fork-heads become shorter, and have much less strain thrown upon them; these are all very important considerations which clearly indicate the convenience and positive advantage of having as long a stroke as possible in the ordinary beam engine. But in the Gorgon engine none of these considerations have any influence whatever; here there are neither beams nor cross-heads; we can increase the diameter of the cylinder to almost any extent, without any local inconvenience whatever.

We shall conclude these observations with the remark, that as it cannot be proved that there is any superiority in a long stroke engine over a short stroke engine, and as it is also evident that there is no disadvantage whatever in employing a short connecting rod, it is therefore clear that the two objections are decidedly absurd and groundless.

NOTES AND NOTICES.

Singular Phenomenon.—At Ellingham, Northumberland, on the 9th instant, from 12 until 2 o'clock, there was a tremendous hailstorm, accompanied with heavy peals of thunder. The snow was actually above two inches thick in some parts, and the people were making snow-balls on the 9th day of July—a thing which never occurred before in the recollection of the oldest person in Ellingham.—*Berwick Warder.*

Annual fall of Meteors.—The Rev. Dr. Parker, of Canton, observed the fall of 64 meteors between 10 P.M. and 11h 45′ P.M. of the 10th August 1839, and on the 11th August between 8h 15 P.M. and 4½ A.M. of the 12, he counted 414 meteors or falling stars: this would appear to give some countenance to the opinion of Mr. Herrick, that an annual fall of meteors occurs in August as well as in November, a circumstance which was observed some years ago, by Professor Olmstadt, of New Haven.

The Nassau Balloon, so called on account of its being the machine in which Mr. Green voyaged through the air to Germany, was yesterday brought to the hammer at the Auction-mart, by Mr. Hoggart, in consequence of the bankruptcy of the proprietors of Vauxhall Gardens, and, after a spirited competition, was knocked down at 500*l.* to a gentleman who, it transpired, purchased it on account of Mr. Green, the scientific aeronaut, under whose pilotage it has made so many successful excursions.—*Times.*

A Preparatory Study.—Before any man sets out to invent perpetual motion, we recommend his practising the trick of getting into a basket and lifting himself up by the handles. When he succeeds at that, he can go ahead with perpetual motion with some prospect of success.—*American paper.*

The Demidoffs.—The munificence of the Demidoffs is well known: the late Count Paul Demidoff, who was a yearly subscriber of the munificent sum of 25,000 roubles (about 1,000*l.* sterling) to the Imperial Academy of Sciences at St. Petersburg, has, it appears, by his will, directed that the same sum shall be paid yearly to that learned body for twenty-five years from the period of his decease, to be applied in prizes for the encouragement of Science and Letters.

Gas from Animal Matter.—A series of experiments has been made upon this subject by M. Seguin, who found that by distilling the carcase of a horse, which weighed 685.41 pounds troy, he could obtain 4.907 gallons of inflammable gas, 30.41 lbs. of sal ammoniac, and 42.2 lb. of animal charcoal or ivory black. It would appear, however, from a comparison with other experiments, that the amount of each product has been somewhat underrated.

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LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 25TH OF JUNE AND THE 30TH JULY, 1840.

[Received too late for insertion in the body of the Magazine.]

John William Nyren, of Bromley, manufacturing chemist, for improvements in the manufacture of oxalic acid. June 26; six months to specify.

Thomas Spencer, of Manchester, machine-maker, for a certain improvement or improvements in twisting machinery, used for roving, spinning, and doubling cotton wool, silk, flax, and other fibrous materials. June 26; six months.

William Jefferies, of Holme-street, Mile-end, metal refiner, for improvements in copper, spelter, and other metals, from ores. July 1; six months.

William M'Murray, of Kenteith Mill, Edinburgh, paper-maker, for certain improvements in the manufacture of paper. July 1; six months.

John David Poole, of Holborn, practical chemist, for improvements in evaporating and distilling water, and other fluids, being a communication. July 2; six months.

Charles May, of Ipswich, engineer, for improvements in machinery for cutting and preparing straw, hay, and other vegetable matters. July 6; six months.

Edwin Turner, of Leeds, engineer, for certain improvements applicable to locomotive and other steam-engines. July 6; six months.

James Harvey, of Basing-place, Waterloo-road, gentleman, for improvements in extracting sulphur from pyrites and other substances containing the same. July 8; six months.

Louis Leconte, of Leicester-square, gentleman, for improvements in constructing fire-proof buildings. July 9; six months.

Joshua Taylor Beale, of East Greenwich, engineer, for certain improvements in steam engines. July 10; six months.

George Barnett, of Jewin-street, London, tailor, for improvements in fastenings for wearing apparel. July 11; six months.

Joseph Getten, of Paul's-chain, London, merchant, for improvements in preparing and purifying whale oil, being a communication. July 11; six months.

William Palmer, of Feltwell, Norfolk, blacksmith, for certain improvements in ploughs. July 11; six months.

Peter Fairbairn, of Leeds, engineer, for certain improvements in machinery or apparatus for hackling, combing, repairing or dressing hemp, flax, and such other textile or fibrous materials, being a communication. July 13; six months.

Thomas Tassell Grant, Esq., an officer in her Majesty's victualling-yard, at Gosport, for improvements in the manufacture of fuel. July 13; six months.

Edwin Travis, of Shaw Mills, near Oldham, Lancaster, cotton-spinner, for certain improvements in machinery, or apparatus for preparing cotton and other fibrous materials for spinning. July 15; six months.

John Lambert, of Coventry-street, St. James, within the Liberty of Westminster, gentleman, for certain improvements in the manufacture of soap, being a communication. July 15; six months.

James Jamieson Cordes and Edward Locke, of Newport, in the county of Monmouth, for a new rotary engine. July 18; six months.

Moses Poole, of Lincoln's Inn, gentleman, for improvements in fire-arms, and in apparatus to be used therewith, being a communication. July 18; six months.

James Roberts, of Brewer-street, Somers-town, ironmonger, for improved machinery, or apparatus to be applied to the windows of houses or other buildings, for the purpose of preventing accidents to persons employed in cleaning or repairing the same; and also for facilitating the escape of persons from houses, when on fire. July 18; six months.

Francis Todd, of Pendennis Castle, Falmouth, gentleman, for improvements in obtaining silver from ores and other matters containing it. July 29; six months.

Alexander Angus Croll, superintendent of the Chartered Gas Company's Works, Brick-lane, for certain improvements in the manufacture of gas, for the purposes of illumination, and for the preparation or manufacture of materials to be used in the purification of gas, for the purposes of illumination. July 29; four months.

John Swain Worth, of Manchester, for improvements in machinery for cutting vegetable substances, being a communication. July 29; six months.

Robert Urwin, of , engineer, for certain improvements in steam-engines. July 29; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND SUBSEQUENT TO THE 22ND JUNE, 1840.

William Neale Clay, of Flimby, Cumberland, gentleman, for certain improvements in the manufacture of iron. Sealed. June 25.

Rice Harris, of Birmingham, Warwick, gentleman, for certain improvements in cylinders, plates, and blocks, used in printing and embossing. June 25

Robert Cook, of Johnston, in Renfrewshire, engineer and millwright, for the making of bricks by machinery, to be wrought either by steam or other power. June 30.

John Hemming, of North Bank, Regent's Park, Middlesex, gentleman, for improvements in gas meters. June 30.

Thomas Richardson, of the town and county of the town of Newcastle-upon-Tyne, chemist, for a preparation of sulphate of lead, applicable to some of the purposes to which carbonate of lead is now applied. June 30.

David Morison, of William-street, Finsbury, Middlesex, ink maker, for improvements in printing. June 30.

Jonathan Sparke, of Langley Mills, Northumberland, agent, for certain improved processes, or operations for smelting lead ores. July 2.

William McMurray, of Kinleith Mill, near Edinburgh, paper maker, for certain improvements in the manufacture of paper. July 2.

Robert Stirling Newall, of Dundee, Forfar, being partly a communication from abroad, and partly by invention of his own, for certain improvements in wire ropes, and in machinery for making such ropes, which ropes are applicable to various purposes. July 2.

Charles Greenway, of Douglas, in the Isle of Man, Esq., for certain improvements in reducing friction in wheels of carriages, which improvements are also applicable to bearings and journals of machinery. July 2.

John Lothian, of Edinburgh, geographer, for improvements in apparatus for measuring or ascertaining weights, strains, or pressure. July 7.

John Swain Worth, of Manchester, in the county of Lancaster, merchant, being a communication from abroad, for certain improvements in rotary engines to be worked by steam and other fluids, such engines being also applicable for pumping water and other liquids. July 7.

Thomas Peet, of Bread-street, Cheapside, London, gentleman, being a communication from abroad, for certain improvements in steam engines. July 10.

Edward Thomas Bainbridge, of Park-place, St. James's, Middlesex, Esq., for improvements in obtaining power. July 10.

John Juckes, of Shropshire, gentleman, improvements in furnaces, or fire-places, for the better consuming of fuel. July 10.

James Harvey, of Basing Place, Waterloo-road, Surrey, timber merchant, for certain improvements in paving streets, roads, and ways, with blocks of wood, and in the machinery or apparatus for cutting, or forming such blocks. July 13.

William Henry Bailey Webster, of Ipswich, Suffolk, surgeon in the Royal Navy, for improvements in preparing skins and other animal matters, for the purposes of tanning and the manufacture of gelatine. July 13.

Alexander Bow, of Crown-street, Hutchesontown, Glasgow, Lanark, Scotland, builder, for improvements in furnaces and flues, by the introduction and application of hot air thereto, and for the consumption of smoke and economizing fuel. July 14.

LIST OF IRISH PATENTS GRANTED IN JUNE, 1840.

John Inkson, for improvements in apparatus for consuming gas for the purposes of light

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WHEATSONE AND COOKE'S ELECTRIC TELEGRAPH.

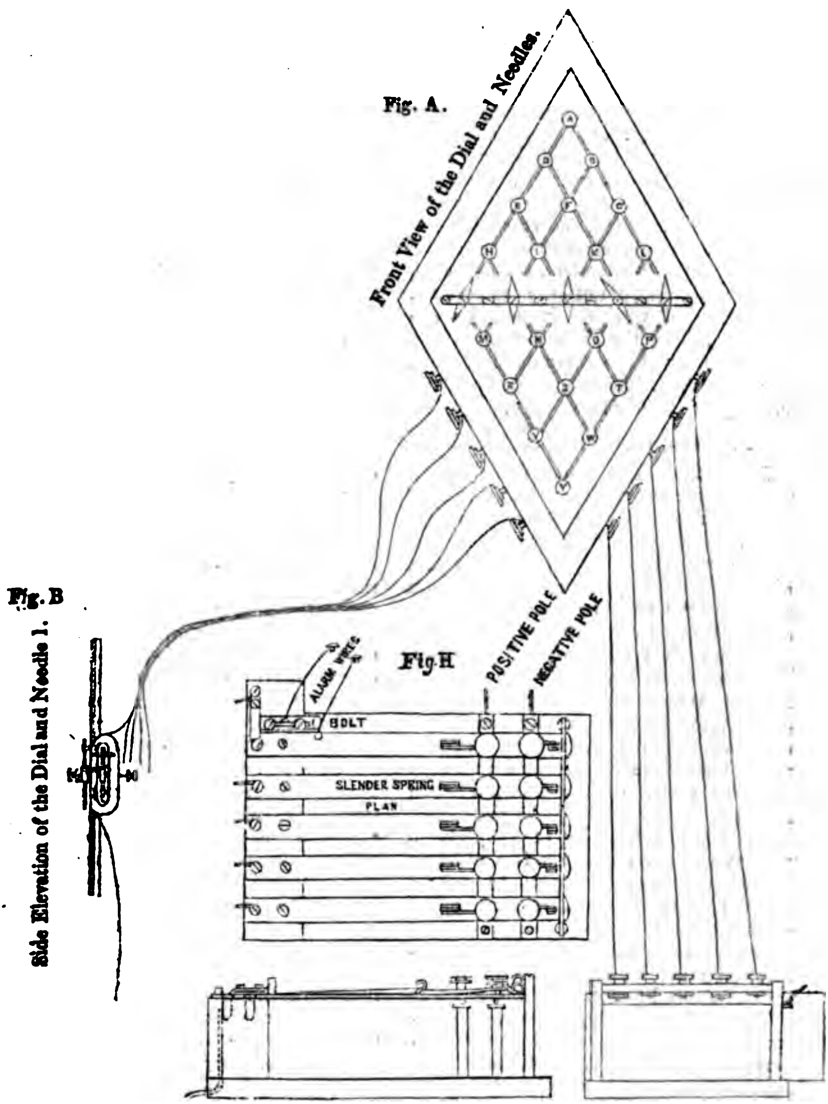

Fig. J. Fig. I.

The possibility of effecting a communication between distant points, by means of and with the speed of electricity, has long been a favourite object of speculation among men of inventive talent; and not few are the plans which have been devised for the purpose. To the ingenious Professor Wheatstone, of King's College, and a very able fellow-labourer in this department of experimental enquiry, Mr. Cooke, the honour however belongs, of having been the first to reduce "the fond vision," into actual and successful practice. The right to their discovery they have secured by patents, and very full and explicit specifications; but we prefer extracting for the information of our readers, the following popular description of the apparatus, the mode of working it and its advantages, from the Fifth Report of the Parliamentary Committee on Railways, just published. The engravings referred to are given in our front page.

Professor Wheatstone examined.

Mr. Loch. You have turned your attention for some time to the means of communicating intelligence by means of wires, by electricity?—I have.

You have tried experiments to that effect to a considerable extent, have you not?—I have been engaged in this inquiry for some years past, and in conjunction with a gentleman, Mr. Cooke, who has turned his attention to the same subject, I have within that time taken out several patents for the means of effecting this object, and the experiments have since been carried to a considerable extent on the Great Western Railway.

It is the continuity of property a railway possesses between two extreme points, which enabled you to try it more effectually? — A railway offers considerable facilities; but the only necessary condition is, that a communication must be formed between two distant places by metallic wires.

Therefore a railway, affording the opportunity by means of continuous property between those two extreme points, enables the experiment to be tried better on a railway than where there is a variety of distinct properties intervening? —A railway offers greater facilities, because greater attention can be paid to it.

Will you have the goodness to describe to the Committee the mode in which you propose to communicate intelligence between two distant points, as alluded to by you?—I have here a copy of the drawing of the specification to the first patent taken out by myself and Mr. Cooke; in all essential particulars the instrument here represented resembles the one at the Great Western Railway. Here is what may be called a dial (fig. A), with five vertical magnetic needles. Upon this dial 20 letters of the alphabet are marked, and the various letters are indicated by the mutual convergence of two needles when they are caused to move; if the first needle turns to the right, and the second to the left, H is indicated. If the first needle deviates to the right, and the fourth to the left, then B is indicated; if the same needles converge downwards, then V is pointed to. These magnetic needles are acted upon by electrical currents, passing through coils of wire placed immediately behind them; here is the representation of one of those coils, with the position of the magnetic needle with respect to it (fig. 6.) Each of the coils forms a portion of a communicating wire, which may extend to any distance whatever; these wires, at their termination, are connected with an apparatus, which may be called a communicator (fig. H), because by means of it the signals are communicated; it consists of five longitudinal and two transverse metal bars, fixed in a wooden frame; the latter are united to the two poles of a voltaic battery, and, in the ordinary condition of the instrument, have no metallic communication with the longitudinal bars, which are each immediately connected with a different wire of the line; on each of these longitudinal bars two stops are placed, forming together two parallel rows. When a stop of the upper row is pressed down, the bar upon which it is placed forms a metallic communication with the transverse bar below it, which is connected with one of the poles of the battery; and when one of the stops of the lower row is touched, another of the longitudinal bars forms a metallic communication with the other pole of the voltaic battery, and the current flows through the two wires connected with the longitudinal bars, to

whatever distance they may be extended, passing up one and down the other, provided they be connected together at their opposite extremities, and affecting magnetic needles placed before the coils which are interposed in the circuit.

Both of these are at the London end? —Yes, both the communicator and the dial.

At each end there is that apparatus? —Yes; there must be a similar complete apparatus at every different station.

Lord *Granville Somerset*.—This telegraph now extends from London to Drayton?—Yes.

Is not there a power at each station of communicating and being communicated to from every other station along the whole line?—There is.

Chairman.—Is there this apparatus at every station?—There may be one at each station if thought proper.

Putting up these at the intermediate stations does not injure it at the ends? —No, it will only require a slight addition to the number of elements of the voltaic battery in proportion to the number of intermediate stations.

Lord *Granville Somerset*.—How do you provide for the case of parties at different stations wishing to communicate at the same moment?—They cannot do so in the same line; the one party must not work his telegraph if he sees it transmitting signals from another station.

Then, before he begins working, he must observe that there is no working at another part of the line?—He will know that by his own instrument, for all are at work at the same moment.

Suppose a party wishes to telegraph from Drayton to London at the same moment that a party at Hanwell wishes to telegraph to London, will the telegraph of the person at Drayton interfere with the telegraph of the person at Hanwell?—Two distinct messages cannot be sent through the same line at the same time from different stations.

Suppose the parties go unconsciously but simultaneously to the telegraph at the same moment?—They could not go unconsciously, because they would see that the apparatus was working.

Therefore they must wait till that working has ceased before they begin to send up their own message?—Yes.

Mr. *Loch*.—Suppose there is a message intended for the extreme end, would the persons at each of those stations be made acquainted with the message intended for the extreme end?—If the same telegraphic dictionary, or if the ordinary alphabetic spelling be employed at all the stations, every person on the watch would know what was going on; but if communication by cypher be adopted, a different one may be used at each station.

Lord *Granville Somerset*.—Suppose at the Drayton station there is an intimation desired to be given of the necessity of sending down an engine, will the parties at the other stations be aware of that message being sent up?—If there is only one line laid down, they would; at present the line consists of six wires, and one telegraph only is worked by their means.

Will the parties at each station know what is communicated from one point to another?—Yes; unless the communication is sent in cypher.

Suppose it is sent in the ordinary way, without cypher or intended concealment, would it be known along the line?—Yes, it might be read at all the stations simultaneously.

They are worked all the way along?—Yes. There is another very essential part of the apparatus I wish to mention, which is, the means we have of ringing a bell before the communication begins, in order to call the attention of the observer; these drawings represent the mode first adopted, but other constructions are now in use. The general principle of the alarum here represented is this: to the detent of an alarum, on the ordinary construction of a clock alarum, a piece of soft iron is fixed, and opposite to it there is a bar of soft iron bent to the form of a horse-shoe; round this bent bar, wire, covered with silk, is wound, forming numerous coils; it is a property of soft iron to become powerfully magnetic when an electric current passes through a coil thus surrounding it. When the horse-shoe bar thus becomes magnetic, it therefore attracts the detent, and the bell immediately rings; when the current ceases the magnetic power ceases also, and the bell discontinues to ring. There are several other contrivances made to effect this purpose. Some arrangements are here represent—

ed to which Mr. Cooke has particularly directed his attention; they relate to the means of establishing communications at intermediate parts of the line where no fixed stations exist. To effect this, posts are placed at every quarter of a mile along the line, for the purpose of establishing a temporary communication with either of the adjacent stations; the guard of a train may thus carry with him a portable instrument, by means of which he can send up a message to a station either way, whenever it may be required. This is a representation of the mode by which this purpose is effected; here is one of the quarter of a mile posts: the wires are carried up through it, and there is, on the top of it, an apparatus to which the portable telegraph may be temporarily fixed, and by means of which a message may be sent in either direction of the line at pleasure.

Mr. *Lock*.—How are those wires kept insulated in the tubes?—First, the wires are insulated from each other by a mixture of cotton and india rubber, which is a very good insulating material; then these prepared wires are all passed, with certain precautions, through an iron tube, which in some parts of the line is buried beneath the ground, and in other parts of the line is raised above it.

That mixture of cotton and india-rubber cuts off all communication between the wire and the tube?—Yes, and between the separate wires; it is a sufficient non-conductor.

Chairman.—You say, a guard may communicate by means of one of these posts put up, with any station?—With the stations either way.

He must carry a portable apparatus?—Yes.

That must be of the nature of the keys, must it not?—The telegraphic apparatus necessarily consists of two parts, the communicating keys, and the dial on which the indicated characters are seen; that which the guard carries must contain both these parts here; the keys and the dial are in the same apparatus.

Lord *Granville Somerset*.—Suppose the Great Western Railway were completed between London and Bristol, do you contemplate the possibility of carrying your telegraph through the whole way, so as to signify from London to Bristol anything you wish to communicate, and *vice versâ* from Bristol to London?—The experiment has not been tried, but I have every reason to believe that it can be done.

You must multiply your power considerably in that case; but if you can multiply your power sufficiently, there is no difficulty, in your opinion, in performing that?—One very important circumstance I have ascertained is the little power requisite to produce this effect; it was formerly thought, that to send a current to any considerable extent very strong batteries must be employed, but in fact a very weak battery is sufficient, provided only it consist of a number of elements proportionate to the distance.

Do you see any practical difficulty in proportioning the number of your batteries to that extent, of 100 or 120 miles?—I think there is none.

So far as your experiments have gone, you think you should be able to effect this telegraphic communication between Bristol and London?—Yes; possibly several stations may be required, but, at any rate, the stations may be at far greater distances from each other than would be required for any ordinary system of telegraphs; my opinion is, that the intermediate stations will not be required.

You think you may communicate to the Reading station, the Reading station to another in the direction of Bristol, and that to Bristol?—Yes; this means would be adopted if it should be found impracticable to effect an immediate communication between the two extreme stations.

Mr. *French*.—Have you any doubt you could do it with one intermediate station, dividing the distance?—The experiment has not been tried; if perfect insulation of the wires can be obtained, there will be no difficulty; theoretically there is no difficulty, but we might meet with practical obstacles in so long a line.

Lord *Granville Somerset*.—How long has this line been laid down upon the Great Western?—I think it was finished in July last. (1839).

Do you think you have had experience enough during the last winter to ascertain that it will not fail you in consequence of any inclemency of weather, or circumstances of that nature?—If the

wires are properly protected, I think there is no fear whatever.

Do you conceive they can be so protected, that weather will have no effect upon them?—Yes, that is my judgment, form experiment.

Mr. *Lock*.—Is there any appreciable loss of time in making a communication from the Paddington station to the extremity of the line to which the telegraph is now carried?—From some experiments I made some years ago, published in the *Philosophical Transactions*, when I first turned my attention to the possibility of effecting telegraphic communications, I ascertained that electricity travelled through a copper wire at the rate of about 200,000 miles in a second; consequently there is no appreciable time lost in the communication of the electrical effect; the only time that would be lost would be at relay stations, if they were necessary.

Mr. *Freshfield*,—Suppose you want to communicate from London to Bristol, how do you signify that your intention is to communicate with Bristol and not with Drayton?—There would be a separate signal appropriated to each station, which would be made before the communication begins, immediately after the alarum has been rung.

Mr. *Lock*.—What is the rate at which light travels?—192,000 miles in a second,

What you described in the first instance is the mode of asking the question; how is the message received?—The person who is attending reads the message from the dial.

Chairman.—Have the applications you have had from foreign countries to put up this means of communication been in connection with railways, or separate from railways?—All in connection with railways.

Is it of any consequence that it should be on a railway, or does a railway offer any advantage in that respect?—Not the slightest advantage with regard to laying down the line, but a great one with respect to its protection from injury.

Sir *John Guest*.—Have you tried to pass the line through water?—There would be no difficulty in doing so, but the experiment has not yet been made.

Chairman.—Could you communicate from Dover to Calais in that way?—I think it perfectly practicable.

Have you any further observations to make?—An electrical telegraph offers a great many advantages over an ordinary telegraph; it will work day and night, but an ordinary telegraph will act only during day; it will also work in all states of weather, an ordinary telegraph can only work in fine weather. There are a great number of days in the year in which no communication can be given by an ordinary telegraph, and, besides, a great many communications are stopped before they can be finished, on account of changes in the state of the atmosphere. No inconveniences of this kind would attend the electrical telegraph. Another advantage is, that the expense of the separate stations is by no means comparable to that of the ordinary telegraph; no look-out-men are required, and the apparatus may be worked in any room where there are persons to attend to it. There is another advantage the electric possesses over the ordinary telegraph, viz. the rapidity with which the signals may be made to follow each other. Thirty signals may be conveniently made in a minute; that number cannot be made by the ordinary telegraph. There is one thing I will take the opportunity to mention: I have been confining the attention of the committee to the telegraph now working on the Great Western Railroad, but having lately occupied myself in carrying into effect numerous improvements which have suggested themselves to me, I have, conjointly with Mr. Cooke, who has turned his attention greatly to the same subject, obtained a new patent for a telegraphic arrangement, which I think will present very great advantages over that which at present exists. It can be applied without entailing any additional expense of consequence to the line now laid down; it will only be necessary to substitute the new for the former instruments. This new apparatus requires only a single pair of wires to effect all which the present one does with five, so that three independent telegraphs may be immediately placed on the line of the Great Western; it presents in the same place all the letters of the alphabet according to any order of succession, and the apparatus is so extremely simple, that any person without any previous acquaintance with it can send a communication and read the answer. This apparatus I shall be happy to show the committee in action at King's College.

Sir *John Guest*.—Does not the possibility of cutting off the communication between one point and another, occur to you?—The same objection may be made with regard to railroads themselves.

Suppose any person were to stop the communication from one town to another?—By destroying the continuity of the rails they might stop the passage of the trains.

The common telegraphic communication could be kept up notwithstanding that?—Certainly.

Chairman.—Can you state the expense which would be incurred in laying it down?—I am hardly prepared to state that, because only one line has been laid down at present.

Mr. *Loch*.—Would it be your view ultimately, supposing the railway completed to Bristol, that there should be one line to telegraph to and another from Bristol?—No; the same line will serve both purposes.

There will be no inconvenience in practice in making use of the same line?—No.

Mr. *H. Baring*.—This sort of telegraph is not in operation on any other railroad?—The Blackwall Company shortly intend to have it.

Charles Alexander Saunders, Esq., called in and examined.

Lord *Granville Somerset*.—As secretary of the Great Western Railroad Company, can you state to the committee whether they have adopted Mr. Wheatstone's magnetic telegraph?—As far as West Drayton, 13 miles.

How long has it been adopted?—It was finished in July last; it has been in operation about seven or eight months.

Was that laid down at the expense of the railroad?—It was laid down under an agreement with Mr. Cooke, who is one of the patentees.

Was it on behalf of Mr. Wheatstone also?—It was under agreement with Mr. Cooke, Mr. Cooke being the copatentee.

Does that agreement extend to any length of time, or has this been only an experiment?—The agreement contemplated the further extension of it, if the Company required it within a certain period of time, after the completion of the first 13 miles.

In fact the Company have laid down this magnetic telegraph at their own expense, under a specific agreement with Mr. Cooke, the Company taking the expense on the one hand and deriving any benefit they may derive on the other?—Yes, just so.

That agreement is determinable at a certain period?—It is.

Is it renewable at the option of either party?—No; I think it is absolutely determinable, not renewable.

Have you any objection to state the term of years?—I have no objection to state the substance of the agreement, but it is very long and very intricate; the material substance of it is this: that within a certain number of months after the telegraph shall have been laid and efficiently worked between Paddington and Drayton, the company might call upon the patentees to give them a license for the whole line, on certain terms; there are a variety of further considerations involved in the agreement, which it would be very difficult to relate.

Is this agreement binding upon the patentees, so as to enable the Great Western Company to execute this telegraph all the way from Bristol to London, for a certain number of years?—It was binding upon them, but the time has now expired.

A new arrangement must be made before any permanent agreement is effected?—Yes, neither party is now bound by that agreement.

Have all the advantages which were anticipated from this telegraph accrued? I think we have scarcely had it in a state to say that we have derived all the advantages which were contemplated from it, because we have, between West Drayton and Paddington, very little inducement to work the telegraph separately for that part; it had much more reference to the more distant stations, and the communications of our line with others, or to communications between places on the line where short and long trains together are running upon the same portion of railroad. As yet we have had no practical benefit of that description, but it has enabled us to ascertain that the telegraph perfectly performs all the duty that was expected of it; as far as it goes, it works perfectly true.

Provided it shall work as well when your whole line is completed, do you anticipate all those useful results that

were anticipated before it was laid down?—I do, indeed.

That is your opinion, after your experience of eight or nine months on 13 miles?—Yes.

In general terms, it is a very expensive thing to lay down this magnetic telegraph?—It is expensive, but that is a question of degree: I have no objection to state the expense incurred; I believe it may be laid at from 250*l.* to 300*l.* a mile, including the charge for station instruments.

In the discussions which have taken place, of which you may have been cognizant, upon the subject of railroad telegraphs, have the directors contemplated the conveyance of ordinary articles of intelligence between Bristol and London?—I think that view was entertained by the company when they originally tried it; the object would be to facilitate all means of communication.

Do you consider that that would be the only means by which the company would be remunerated for the outlay?—I think the usefulness of it to the railway itself is the chief remuneration; it is calculated undoubtedly to simplify the working of the railway, and to diminish the stock of every description, whether of engines or of carriages; to insure greater punctuality, and, in cases of accident, to repair the injury with the least delay, as well as to produce general advantages and greater security in working the railway.

You think you might have a less establishment, and less stock, in consequence of having this magnetic telegraph, than you otherwise would be obliged to keep up to conduct the line?—Undoubtedly.

And that in that way the company would be remunerated?—I think that would be a mode of remuneration; I do not say to what extent it would operate, as compared with the expense of the telegraph itself.

In addition to the remuneration thus derived, do you conceive it will be an effectual mode of assisting in case of accident to passengers? — Certainly, it would be so.

And in some instances of preventing accidents?—Yes; if a line were at any place stopped up, and a communication could be made by telegraph, it would prevent the danger of collision from a subsequent train running up to the place of danger.

Mr. Wheatstone has stated that it is intended that a guard should have a portable telegraph, capable of operating at the distance of every quarter of a mile?—Yes, that is a plan proposed; it has not been carried into effect on our line at present; there are places to which the portable telegraphs may be applied, but the men have not been instructed in it yet.

Supposing that idea were carried out, would it not be the cause of great safety in case of sudden emergencies, or fear of accidents?—Yes; I have no doubt security against accidents would result, and more prompt assistance in case of accident.

Suppose an engine unexpectedly became unfit for service, have you not, in the course of the last few months, occasionally sent to another station for another engine, by means of the telegraph?—Yes, we have, on one or two occasions within a few months; we worked the telegraph for nearly two months, so as to communicate to Paddington the moment of the passing of the train at West Drayton and Hanwell; that was done for the purpose of trying whether the telegraph would constantly work, and whether we could rely upon it, and it answered the purpose, certainly, admirably.

Do you contemplate continuing that constant use of it? No, we do not work it in that way; but it is used in any emergency; they can transmit any intelligence between West Drayton and Paddington, which it may be material to receive.

If parties will want horses when they come to the Paddington station, you are in the habit of sending on intelligence of that?—Yes, we are; I think the chief use of the telegraph, what I consider the chief advantage of it, would be upon the junction of two lines, where they are to be worked by the engines of one line; for instance, upon the line from Bristol to London, at the junction of the Cheltenham Railway, it would be a very great facility indeed if it could be ascertained at the moment at which the train comes up from Bristol which is to receive the Cheltenham traffic, that the Cheltenham train is on its progress, and either within five minutes or not within five minutes

of the place; by that means there would be no useless delay to either train, and in the same manner the down train coming up would be able to send previous intelligence from a station, by which the engine for the Cheltenham train would be ready at any time to take the train on, without any loss of time.

It would also, in case of any want of exactness in the arrival of a train, prevent collision, would it not?—It would, and it would reduce the expense of working the line; the superintendent might be enabled, in many cases, by delaying a train only a few minutes, to save the expense of a second engine being sent for a long distance.

In case of any severe fogs in any particular district, would it not be a great advantage that the trains coming into that district should be made aware of that circumstance?—Yes, I think in the case of our working short trains, which we shall probably do from Slough to London, independently of the Bristol trains, it would be very important for us to know at Paddington when a train is approaching, whether it be a Slough or a Bristol train, and for those at Slough to know that the long train is coming up, and is within a certain distance or not within a certain distance, that they may prepare accordingly, whether to send on that train from Slough to London, or to delay it for a short time.

Suppose you wish to send an extra train from one point of your line to another, without any means of communication, there must be always a certain degree of danger either of running into another train or meeting another train? —Yes, we are obliged to allow a certain interval to elapse before another is sent.

That is not always a certain means of preventing collision, is it?—No, it is not.

By means of this telegraph, could not you guard against the danger of accident in that respect?—Undoubtedly, it would tend to security in those cases.

Mr. *Loch*.—Would not the possession of such a means of conveyance, after the telegraph is completed as far as Bristol, give the possessors of the telegraph a great advantage in a commercial point of view over the rest of the public?—It might do so, if they should choose so to avail themselves of their property.

Has it ever occurred to you what remedy the public might have under those circumstances?—I do not see how they possibly could have any remedy at all; I do not see why they ought to have any remedy.

Would it be unfair, under those circumstances, that the Railway Company should give facilities to other parties to erect other telegraphs along their lines, paying the company for such facilities? —I think the company would not object to other parties having a facility if they were sufficiently paid for it; but I cannot conceive if a party possesses property, why he should refuse to make it useful to himself, or why he should be called upon to make it as useful to another as to himself.

Take the railway to Portsmouth, would it be at all a matter that would be indifferent to the country, that the directors of that railroad should have the means of communicating by means of their telegraph with London, while the Government is deprived of all communication between the principal naval station and the capital in the same manner?—I think the case cannot arise; Government will have the power of course, if they choose to pay for it, of putting a telegraph of their own between Portsmouth and London; and there is no telegraph which could exist, whether on the Southampton or any other Railway Company possessing which would prevent the Government having the use of it, if they choose to pay for it; Government might have one, of course, if they would go to the expense of making it.

What expense do you refer to?—The expense of buying land and putting it down.

Would it not be a much more ready way to give the Government the power to lay down the telegraph on the railway itself?—Paying for it, I do not see the slightest objection to it.

Lord *Granville Somerset*.—Suppose a restriction of the advantages of the Railway Company to that which may be called their own peculiar business, and not allowing it to transmit other intelligence?—It strikes me that that would be a prohibition to the Company laying it down at all.

Mr. *Loch*.—You think if this rule were laid down, that all the intelligence of those who telegraph should be made

public with the exception of that on their own affairs, that would operate as a prohibition to their laying it down at all?—I scarcely know as to any rule of its being made public; I am answering these questions very much in the dark, but it strikes me that saying "You may lay it down, but you shall not use it except in a particular way," would amount to a prohibition.

Mr. *Green*.—Do you see any objection to compelling the company to allow persons to send any information they please by means of your telegraph?—I see none at all, under particular arrangements, inasmuch as I think that is what they would do as a matter of course; but then it must be subject to certain regulations of the company; they could not consent to its being taken out of their hands, when theyare using it, and given to another; of course the transmission of general intelligence would be one source of income derived from it.

Mr. *Loch*.—How would this operate upon the construction of a telegraph of this sort, if the government were to have the power, paying for it, to be enabled to lay down a telegraph of their own; would that operate with the directors in preventing their laying down one of their own?—I think not at all; I cannot conceive that it would be their wish to prevent government possessing one. I think if an expenditure shall have been incurred by any company in laying down one under the expectation that they will derive the benefit of it, whether in transmitting railway information or general information, being properly paid for it, if they should be obliged to permit another company to lay down another telegraph on their line, that would be a great hardship; but I am sure they would do everything they could to facilitate the views of government.

Lord *Granville Somerset*.—Supposing the government were to lay down a magnetic telegraph from London to Bristol, and supposing that any parties were allowed, under certain regulations, to communicate by that telegraph, would you see any objection to that?—I expressly reserved that it should be used for government purposes only. It never could answer to lay down two telegraphs; it would be a great hardship to make the possessor of the soil give up his right to enable some other party to compete with him.

Mr. *Loch*.] Confining it to government purposes, you see no objection to allowing the government to lay an electrical telegraph?—None whatever; at the same time I should state that it is a subject I have not much thought of or considered, and therefore I fear my opinion is worth nothing.

Chairman.—Why was not your telegraph put under ground?—It was attempted at first to be put under ground, but the wet got so much to it, it was found better to put it above ground, to secure it from that injury. I believe one of the great difficulties the patentee had to contend with at the time has been since remedied by making the tubes more impervious to the wet. — (Mr. *Wheatstone*.) I wish to make an observation with regard to the expense of the line: the cost of the present experiment has exceeded 250*l*. per mile. We will assume that it cannot safely be reduced, though I think with more experience it might be; if we consider that the cost of laying down the whole telegraphic line from London to Bristol will be only the cost of one mile of the railroad itself, the expenditure will not appear great, considering the benefits to be obtained; this is less than one per cent. upon the original estimate of the expenditure. Now would it not be worth while to go to that expense to obtain all the advantages that will undoubtedly be obtained by the telegraph? I will make a few observations with regard to the proposed Government line. The principal expense of laying down the telegraph line is, in fact, the iron tube and the other things connected with it. The mere cost of the wires is very little, not more than 6*l*. or 7*l*. per mile each. As many wires may be put as you please in the same tube, consequently, supposing an iron tube to be laid down from hence to Portsmouth, if wires for three distinct lines were enclosed within it, the expense of each line, considered separately, would be very considerably diminished. One line might be appropriated for the rail-road purposes alone, another for general commercial intercourse, that is, for sending messages for any parties who choose to pay for the accommodation; and a third for the exclusive use of the Government. There would be no difficulty, if the Government have a telegraphic line thus asso-

ciated with the others, to make the terminations in their own offices, from the Admiralty in London, for instance, to any office belonging to the same department at Portsmouth, so that information may be sent without communicating with any persons but their own clerks. If this plan were adopted, it would do away with every objection which has been made with regard to the injury a private Company would do to the public, by having the exclusive means of intelligence in their own hands; and I am sure any railway Company would enter willingly into an arrangement, by which Government might possess an exclusive line at a very moderate expense, much below that at which they could lay it down themselves. If the new telegraph of which I have spoken succeeds, and it has suceeeded perfectly so far as experiments have yet been tried, we might place three telegraphs in connection with the six wires now used on the Great Western Railway, and these might be applied, as I have said before, to three specific purposes; one exclusively for railway purposes, another to be let to any persons who choose to avail themselves of it, and another for Government objects.

Would it be possible, by any portable instruments, for any third party to become acquainted with the messages sent on account of the government?—If the government feared any thing of that kind, they must use a cypher; communications by the electric telegraph would be far less public than by the present visual mode; at present everybody knows when a telegraph message is being despatched, and any person acquainted with the signals might read it.

Is it not the case, that by a little attention any person can possess themselves of any cypher?—Very ingenious systems have certainly been decyphered, without any knowledge of their keys; but the task is no easy one. An extremely simple and safe mode of cypher has been devised, by means of which a person may communicate with a thousand correspondents, it being impossible for any one of them to read what is intended for another.

Mr. *Freshfield*.—Have you made a calculation of the probable length of time the apparatus will continue, without requiring to be renewed?—That is a question I cannot answer; but it comes to this: how long can the iron tube which contains the wires be preserved; the wires themselves would remain uninjured for an indefinite period, if the tube be kept perfectly water-tight.

Do you think the wear and tear of the apparatus from London to Bristol would be less than the wear and tear of the railroad for one mile?—Far less.

Mr. *Lock*.—Do you spell every word by the present mode?—Some signals are used, but the words of a message are generally spelt.—(Mr. *Saunders*.) We have some conventional signals; the others are spelt. While we were working the telegraph, we worked it for some time intermediately through the Hanwell station, to try the effect of dividing it into different lines of telegraph; there was evidently no perceptible difference of time from Drayton to Hanwell, and from Hanwell to Paddington; for the same party having a double instrument at Hanwell, the instant he saw the signals on one he touched the keys of the other; the effect is quite instantaneous; in that way it might be sent to almost any distance.

For a further account of Messrs. Wheatstone and Cooke's latest patented improvements, referred to in Professor Wheatstone's evidence: See extracts of Recent Specifications, p. 189.

ON THE GOOD PROPERTIES OF CHICORY AS A SUBSTITUTE FOR, OR AN IMPROVER OF COFFEE.

Sir,—It is about two and thirty years since the useful and nutritive properties of the root of the "Wild Endive," or "Dandelion," was made public in England, so as to have rendered it a useful substitute for, or assistant to the article of coffee. When Buonaparte laid his iron hand on our commerce, by shutting up our export trade to the Continent, the utility of chicory, disseminated at first, by the German and French papers, gradually became known here. I recollect, whilst residing at the station-house, on the rude mountain of "Cefn Ogo," in Denbighshire, North Wales, in 1808, first trying an experiment with some wild plants of this species, which grew profusely in that district, which were similar in form to a carrot, and about the size of a man's little finger. These I roasted, and afterwards ground to a fine powder, and I was surprised to find

how strikingly their flavour resembled that of good or middling plantation coffee. Admitting that the same was somewhat less pungent, or aromatic, than the latter, I found it to possess the great recommendation of being perfectly wholesome, and entirely devoid of that acidity which renders coffee so objectionable to the stomachs of many persons Since my residence in London, I have regularly used it for the last five years in equal proportions with "the boasted berry," of Arabia. Notwithstanding its good properties, chicory cannot be said to possess an equal ratio of strength with the best Turkey, or even Jamaica coffee; perhaps it may be put down as being deficient as compared with coffee of about $\frac{1}{4}$th. I know many persons have used it as a breakfast beverage, who dare not venture upon coffee. The patient Germans thrive well upon it, and I understand, with their due economical foresight, that they in many parts use the leaves of this plant as a substitute for tea; this wholesome root, therefore, may be said to have two useful properties. Having said thus much, I must observe, that chicory bears the palm far beyond Mr. Henry Hunt's noted radical powder, (roasted rye), which was so much puffed in its day. I breakfasted with that spirited individual in the year 1823, at his then residence in Charlotte-street, Blackfriars, when he said "he would give me a treat," but in spite of Mr. H.'s infusing a very liberal quantity of his "British coffee," as he termed it, so as to make a very strong decoction, further assisted by a quantum of excellent cream, I found the taste to be flat, if not insipid; besides, Mr. H.'s roasted rye had these further drawbacks—it required twice the quantity that coffee did to give it due drinkable strength, besides a double quantity of "Mauritius," to give it sufficient sweetness. Knowing these good properties of chicory, I must say I wish to see it consumed on a more extended scale.

I remain, Sir,
Your most obedient servant,
ENORT SMITH.

THE WASH-HOUSE NUISANCE.

Sir,—In a recent number of your interesting publication (No. 879, p. 31) is a letter signed "A Director and Guardian," inserted with a view to obtain a remedy for a nuisance experienced occasionally by private families, and felt more particularly in wash-houses, hospitals and other large establishments, namely, the great inconvenience arising from the steam in wash-houses. It is an evil, however, for which I am happy to inform you I have found an effectual remedy by the use of a particular bleaching fluid which I have prepared, and with which I have supplied my friends for some time past, who speak of it highly. The employment of this liquid altogether obviates the necessity of boiling water, since diluted with many times its own volume of that element, either cold or slightly warmed (and which latter is somewhat better,) it takes out stains of almost every description, and with a great economy of labour, by allowing the linen to soak for some time previous to commencing the manipulating process. It removes grease from poulterers' and butchers' blocks, and renders them extremely white without scraping, and is useful for a variety of purposes; while so far from possessing the caustic qualities of soda, I not unfrequently make use of it in shaving.

I have not hitherto attempted to make a profit of this article, but should not hesitate to undertake to supply your correspondent with any quantity he may desire of it, at a price that would render its employment decidedly more economical than the use of soap.*

I remain, Sir,
Your obedient servant,
G. H. BURSILL.

River Lane, Islington, July 18, 1840.

Wash-House Nuisance.

Sir,—The invention of your correspondent "M" seems cheap and sufficient for removing the steam from the boiling copper—but what is much wanted—is to remove the steam from the hot water in the *troughs*. It is usual to lay the hot water into the troughs, when sometimes from *ten* to *twenty* women are employed to wash the whole day. Which is the best way of carrying off this steam, particularly in damp weather?

A DIRECTOR AND GUARDIAN.

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* An article professing to have all the properties of the above, has been for some time in considerable request, under the appellation of "Fry's Detergent."—Ed. M. M.

ON THE DISCOLORATION OF OILS AND RESINS.

Sir,—Perusing, as I regularly do, your valuable Journal, I observed in your late numbers some rival claims to originality on the subject of separating the coluring portion of animal and vegetable oils. There certainly can be no objection to any individual declaring his priority of the knowledge of a particular mode or modes whereby valuable ends are attained, although they may exactly accord with those of patentees; only let such be done with becoming courtesy; for the exclusive right of public use appertains (according to the English patent laws,) to the patentee, so long as the principle of any process has not been previously, and openly employed for the purpose of profit and gain; otherwise it can only be employed in the way of elucidating experiments, or for private and individual purposes. As the following declaration may tend to stop further controversy on this subject, I beg to inform you, that I employed the very same materials, and in nearly the same proportions, as far back as the year 1828, and erected apparatus (which no doubt exists to this day) on the premises of a large seed crusher, not far distant from the town of Worcester, and can produce samples of oils so deprived of their colour, if it were requisite. I further employed a similar process, though under different circumstances, for depriving resinous gums of their colour, which answered all my expectations, and when I return from a journey I am about to take, I will furnish you with the process, as it may prove useful to some of your scientific readers, as I have been able to produce many beautiful compounds with such discoloured resins.

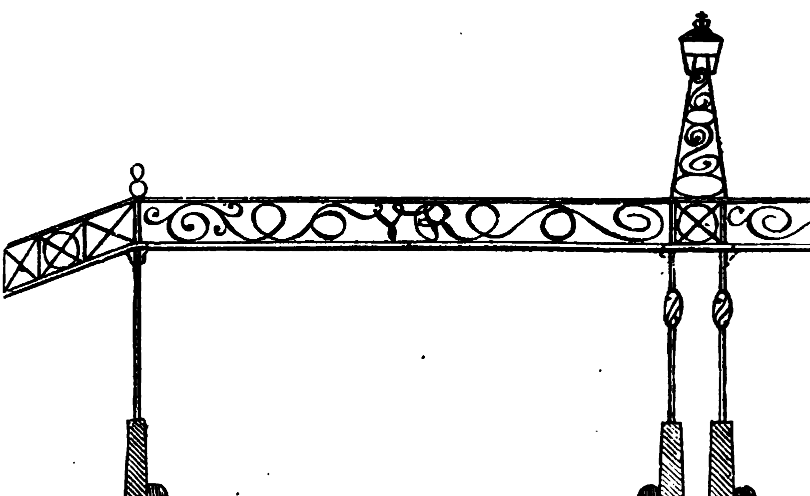
Meantime I beg to subscribe myself,

Sir, yours respectfully,

F. A. P.

Cambridge Heath, Hackney, July 8, 1840.

ON IRON FOOT BRIDGES FOR STREET CROSSINGS.—BY SIR J. EDWARD ALEXANDER.



Sir,—Very great danger and delay are often experienced at "the crossings" of many of the thoroughfares of this overcrowded metropolis between the hours of 11 and 5, and unless the foot passenger has then "an eye in his neck," or, in oriental phrase, "carries his beard on his shoulder," it is no easy matter to escape unscathed from the consequences of the recklessness of the drivers of public conveyances, whilst even some private vehicles are conducted through the

streets seemingly in utter disregard of the precious limbs and lives of the lieges. It is very vexatious, too, for those "on business bent" to await the slow movement and disengaging of double lines of carriages, whilst an assemblage of persons at a crossing affords excellent opportunity for the light-fingered gentry, the *chevaliers d'industrie*, to practise their "art of diving" into the pockets of the unwary.

What is the remedy? I can see none other than that of *foot-bridges* of cast-iron, with an easy ascent (crossed by batons, not steps, on each side), for such crossings as those at the back of St. Paul's cathedral, at the top of Ludgate Hill, from Cockspur-street to the Opera Arcade, in Regent-street, where it is crossed by Piccadilly, Oxford-street, &c. Perhaps a dozen would suffice as a beginning.

The height of these bridges might be such as to admit the free passage of stage-coaches and their outside passengers, without stooping, whilst to permit the passage of those monstrous luggage vans, which tower to the height of 30 feet, it would be necessary that part of the bridge could be raised after the manner of a drawbridge, or that it could be swung open, horizontally, by means of windlasses, whilst projecting spring bells on either side would warn careless waggoners of their arrival at the bridge.

If the bridge were divided into two parts by pillars, surmounted by a handsome lamp, it might be better than a bridge of one span.

The breadth of the bridge to be such as to admit seven persons to cross abreast, and at night when the crowd and bustle of carriages and foot passengers are trifling, the moveable parts of the bridge could be left open or swung back, and the access to the footway closed to prevent accidents. The sweepers would then be able to earn their "small halfpenny" in their usual way.

I think that bridges of this description, so far from being "eye-sores," could be made very ornamental. The lamp over the central arch might be surmounted by a crown, the side rails might have the cypher of Her Majesty, V. R., in a scroll pattern, and the whole design might be light and elegant, whilst the convenience of the citizens would at the same time be materially promoted.*

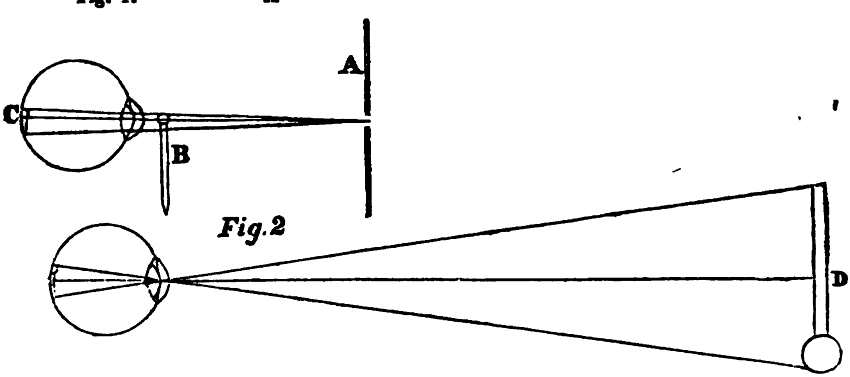
I am most obediently yours,

J. EDW. ALEXANDER.

J. U. S. Club, July 18, 1840.

THE CAUSE OF A TRULY ERECT IMAGE ON THE RETINA OF THE EYE APPEARING INVERTED.† BY SIR GEO. CAYLEY, BART.

Fig. 1. A



If A, fig. 1, be a card with a pin hole through it, and rays of light from objects well illuminated behind it are passing through this aperture, any small object placed very near the eye (as the pin B,) will cast its shadow upon the retina of the eye at C, because the object is too near the crystaline humour to

* We readily give insertion to this valuable suggestion; at the same time we beg leave to observe that a similar plan was proposed by the late Mr. Wm. Reed, in our 17th vol. page 175.—ED. M. M.

† I am not aware who first discovered this fact.

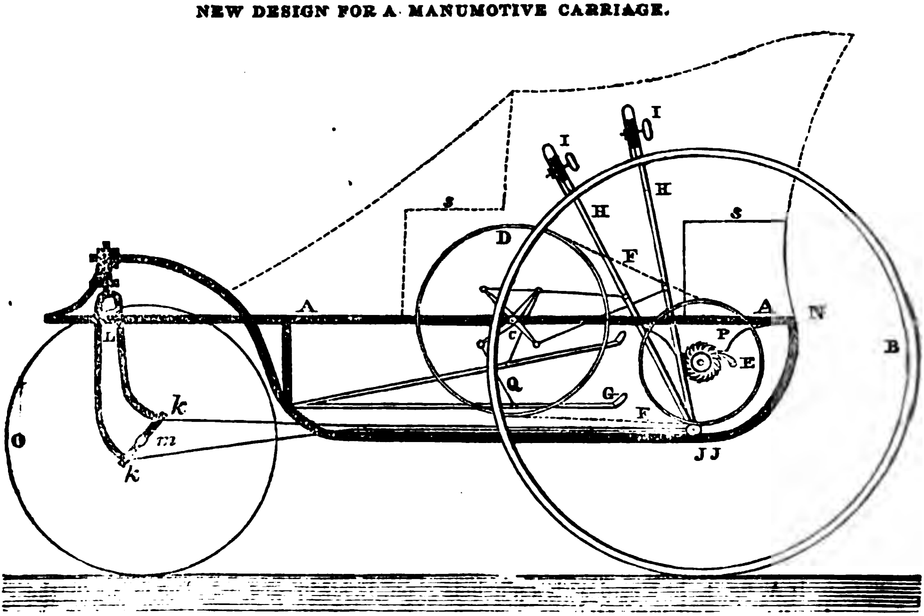
be much influenced by its refractive power; the rays are not brought to a focus, and the image is a mere common shadow, and therefore not well defined; and like all other shadows, it is not inverted, as the images of natural vision always are.

The eye thus receiving an image, such as it would receive from an *inverted* object at the nearest distance at which it could be tolerably within its focus, as at D, fig. 2, accepts this shadow (which is rendered tolerably well defined from the smallness of the aperture from which the light radiates as from a point), as an usual imperfectly focused image, from an inverted object rather too near to be quite distinctly defined; and the object is conceived to be magnified, because at that distance to which the image is referred, it would require the object to have magnitude in proportion to the distance, to give the angular extent of the image perceived by the retina. This will be quite obvious by inspecting fig. 1, where the same image on the eye as in fig. 1, is traced out to that which would produce it in ordinary vision. This is a very good proof that from habit the eye refers the understanding, to conceive of objects being in their real places, and *externally*, though received unconsciously by an *internal* sensation. Unless the images on the retina had been inverted as respects the objects, *(because the eyeball turns on its axis)*, it is obvious that if the eye be required to direct its axis downward to view the bottom of an object, the retina will *rise upward* in that act, and hence trace the inverted image to its *base;* whereas had the images been erect, in thus looking *downward* we should have excluded the base from our view, and traced the image backwards to its top. This would have caused a much greater puzzle to the philosophers than the inverted image has been, and which this simple case tends greatly to explain.

GEO. CAYLEY.

20, Hertford-street, July 24, 1840.

NEW DESIGN FOR A MANUMOTIVE CARRIAGE.



Sir,—Having seen several plans in your valuable Magazine for manumotive or exercising carriages, I take the liberty of sending you a sketch of one, with the dimensions for a full size. I have one which I made as a model, with largest wheels 15 inches diameter, and front wheel 10 inches, which is used by my

children—one (of 7 years) will run it about the rate of 3 or 4 miles an hour; a full size might be run 10 miles an hour with a slow uniform movement. Cost, I suppose, about 10*l*.

If you think this account is worthy a place in your Journal, it will much oblige,

Yours most respectfully,

J. SQUIRRELL.

4, Stownpland-street, Stowmarket, Suffolk, June 8, 1840.

Description.—A A, principal supports of carriage, 7 ft. 9 in. long; B, two 4½ feet diameter wheels; C, crank axletree, fixed, 2 ft. 9 in. from N; cranks 6 inches each. D, two 2 feet pulley wheels. E, 1 ft. 3 in. diameter pulley wheels, with ratchet in nave to allow wheels to run on in going down a hill, with levers standing still; FF driving band (dotted;) Q foot levers, 3 feet long, pressing on crank axletree, 1 ft. 3 in. from the ends G G; H H hand levers, 3½ feet long, with a 5 inch diameter pulley attached to each handle I I, with cords passing under pulleys at J J to K K. By turning these hand pullies (which can be done whilst working the H levers,) you are enabled to guide the carriage, and by having the front iron L bent a little, the carriage will run straightforward, so that in guiding it you only require to alter the course at bends of the road, which is a help; an upright iron is likely at any instant to turn out of its path, if not strongly held. M, axletree of front wheel, 2 feet long; O front wheel, 3 feet diameter; P springs; S S seats; the posture for sitting is nearly upright, a rest to be placed for the feet, when not required to work, as would be the case in all descents, ever so small, the hand levers being quite sufficient to drive with. A brake might also be attached to great wheels to steady or stop a carriage in going down hills.

"NEW THEORY OF THE UNIVERSE."

Sir,—I should not again so soon have requested the insertion of another paper in your valuable work had I not received two letters on the subject of my communications to you, which appear to render it necessary. The writer of one of these letters seems to understand my theory and to approve of it, the writer of the other to misunderstand and to condemn it. *Una vox librorum sed non omnes æque informat.* However, in this instance some fault may rest with me, for, as that eminent writer, Mr. Whewell, observes, in his preface to Butler's Sermons, "the show of clearness is easily acquired by him who has to trace into its consequences a principle already admitted or assumed; but the effort by which we obtain possession of the peculiar idea involved in a new principle is hard to communicate in a precise manner." Inasmuch as my theory opens a new path for the inquiry into the nature of heat and cold, and hence is of the greatest importance to the arts—inasmuch as my theory offers a rational and obvious cause for an effect for which otherwise an imaginary cause is assigned—I own that I am particularly anxious that it should be well understood and thoroughly investigated by those who are capable of seeing clearly, thinking deeply, and judging impartially. Talent, courage, and generosity, are alike necessary to induce a person to interest himself in the success of a theory suggested by another, the importance of which must at first be faintly impressed on his mind. I do not mistrust my theory, but I do mistrust my own powers of developing it, and I do mistrust the possibility of finding a person of adequate talent, courage and generosity to examine it as it deserves to be examined. An approved author of the present day asserts, "the only distinct notions we are capable of forming respecting matter are that it consists of certain powers of attraction and repulsion, occupying certain portions of space and moving in space; and that its parts thereby assume different relative positions and configurations." My theory does not admit of space, solidity and compactness are equipoised by rarity and extent. Plato says that "man is nature's horizon, dividing between the upper sphere of immaterial intellects and this lower of corporiety." The metaphor might have been carried further. Nature's horizon he divides also between the rarity which has no matter, and the solidity which has no rarity. Not to touch on metaphysics, I content myself with taking animal and vegetable life as the pivot on which all heat, all cold, all weight, all lightness, and, consequently, all motion depends,

Previously to having been acted on by life all matter is positive cold; after having been acted on by life it is positive heat, either latent or sensible; by positive heat and positive cold I mean a fluid in two opposite states, one producing the sensation of cold, the other the sensation of heat. The state of heat being liable to be lost beyond the sphere of the sun's action—beyond that is, the distance to which his exhalations extend without interference with the exhalations of other spheres. Hence a continual circulation of the fluids of the Universe by (as I have elsewhere remarked), the absorption of the cold fluid to supply the exhalation of the warm fluid. The fate which generally awaits the first promulgation of any new thing that is worth having, will most probably attend my theory for the present. That of Dr. Harvey and his theory of the circulation of the blood, will be a warning to any one not to adopt too readily the suggestion of another. Should any one do so in this case, there may, perhaps, be more than one coincidence between his fate and Dr. Harvey's*—a fate not very desirable for those who do not prefer future fame to present enjoyment.

Allow me to thank you, Sir, for the obliging manner in which you have inserted my papers, and to remain,

Yours, &c.

E. A. M.

July 14, 1840.

COMMON ROAD STEAM CARRIAGES.

Sir,—I observe in the last week's number of your Magazine a letter on common road steam coaches, signed "A. Gordon," in which he states that all the common road steam coaches hitherto built have gone pretty well on level roads, but that the moment the road is bad, laid with gravel, or the carriage ascends hills, the full power of the engine being of course exerted, the immense pressure, aided by the collisions so natural on common roads, *has invariably been attended* with injury to some part of the engine, and he then proceeds to state that in the trips I have made to Brighton in my steam coach the same result has taken place.

I beg to state that such is not the fact—that in all the trips I have made no derangement of any kind has taken place except once, on taking in a quantity of muddy water, and then it merely retarded the progress of the carriage slightly—that I have, with the carriage full loaded, ascended the steepest hills on the Brighton road, namely, Hemel Cross hill and the Red hill, at 12 miles an hour. I have since that time been three or four times to Seven Oaks and Tunbridge Wells, the most hilly road out of London, and I have never once experienced the least derangement of the machinery that has at all stopped my progress, and the average speed of each trip has been 16 and 17 miles an hour.

I do not wish to detract from the merits of the superior plans Mr. Gordon may have for his machinery, but think that it is hardly fair that without making inquiry he should publish such erroneous statements, tending to the injury of an individual, as those contained in his letter. Begging the insertion of the above,

I have the honour to be, Sir,

Your most obedient servant,

F. HILLS.

Deptford Chemical Works,
July 20, 1800.

Common Road Steam Carriages.

Sir,—In reply to your correspondent, who writes in your last number about the "*impossibility*" of common road steam carriages going up hill, and who evidently never did me the honour of accompanying me to Harrow, Watford, &c. during the eighteen months that I daily run up those hills twice as fast as any thorough-bred team of horses in England, I beg leave to send you the copy of a note addressed to me by Mr. Beale, the well-known engineer, which is as follows:—

Yours, &c.,

F. MACERONE.

(COPY.)

"East Greenwich Iron Works,
July 20, 1840.

"Mr. Beale takes this opportunity to inform Colonel Macerone that himself and a party (twenty-three) this day went to Footscray, in Kent, at the rate of 20 miles the hour most of the way, and *could* have gone much faster. We went *up* Blackheath hill at the rate of 12 miles

* I believe the Doctor lost his practice and his money by attending to the suggestion of *a lady* on the circulation of the blood.

the hour, with only one wheel clutched, without a pause. Wednesday last we ascended Shooters' Hill at the rate of 14 miles the hour, without a pause, with the steam blowing off when we arrived at the top."

"P. S. In London-street, Greenwich, we went over above a hundred yards of deep loose gravel in gallant style, all up hill!"

MR. HALL'S SYSTEM OF CONDENSATION.—MR. OLDHAM IN REPLY TO SCALPEL.

SIR,—The language and style of your correspondent "Scalpel" is universally so justly appreciated, that I shall not make one remark upon it; nor should I have troubled you with another communication, were I not called upon to confirm and explain some statements contained in my letter to you of the 29th ultimo, published in your 882d Number, and particularly by Mr. T. Hawke, in your last week's magazine, respecting the actual vacuum in each chamber of Mr. Hall's condensers. In the latter number "Scalpel" puts in a note of explanation, in which he says, "I spoke of two gauges simply as a means to enable the time of both vacuums to be noted as an answer to Mr. Oldham's inconclusive fact of one gauge being connected with the top and bottom of the condenser." Now, how can "Scalpel" term what I said respecting that fact—*inconclusive;* I will repeat my words and leave it for any one to judge how far "Scalpel" is justified in the above statement. "I would here mention a fact of which "Scalpel" does not appear to be aware, viz.: the pipe by which the vacuum gauge is attached to the engines of the *British Queen*, has two branches furnished with cocks, one leading to the lower chamber of the condenser, and, of course, below the condensing pipes; and the other, to the chamber into which the steam immediately enters, as it leaves the working cylinder. How can any one be at a loss to understand, that when the cock on the branch pipe leading to the bottom chamber of the condenser is shut, and that on the branch leading to the upper chamber is open, the gauge will be connected, any required length of time with the latter, and show the amount of vacuum therein; and, that when the cocks are reversed, and, of course, the guage stopped off from the upper-chamber and connected with the lower one, that the vacuum in the latter will be shown in the same way. It is evident that the gauge may be attached for any length of time to the upper-chamber, and then be changed and applied for any period to the lower-chamber. Why, then, does "Scalpel" assume, that the experiment has been unfairly made by merely opening the gauge cock for an instant previous to the termination of the upstroke of the air-pump. However, I distinctly assert, that no such trickery has been practised, and that the vacuum in the upper chamber is shown for any required length of time, by being connected with the gauge as above mentioned.

I should have said a word or two in reply to Mr. R. Armstong, to prove that the real superiority of Mr. Hall's condensers over the common condensers, is more clearly shown by the vacuum gauge when attached to the upper chamber of the former, than even by the indicator. But Mr. Hawke has done it in so beautiful and lucid a manner, that I need not add another word on the subject. I will, notwithstanding, follow in his wake, and tell Mr. Armstrong, without fear of contradiction, that if, with a vacuum in the top chamber of Mr. Hall's condensers of 30½ inches, there be only an average effective vacuum of 25 in. in the cylinders; the result would be, that if the vacuum were less by 3 inches in the condensers, or only 27½ inches, in the same proportion would it be reduced in the cylinders, viz.: from 25 to 22 inches, which is a clear proof of what Mr. Hawke has explained, viz.: that the indicator shows only the degree of perfection or imperfection of the valves &c., whereby the steam is allowed to pass more or less freely from the cylinder to the condenser. This, perhaps, may justify Scalpel's using the words "slowness of the process"—not indeed, in condensation, but in the passage of the steam from the cylinders to the condensers—no matter whether they are Mr. Hall's or the common condensers.

I do not know what Mr. Armstrong wishes to intimate by stating that he happens to have had long in his possession, the actual original indicator card ("whereby there hangs a tale.") The fact is this, Mr. Peterson took several cards, all of which may be called originals. The card in the Mechanics' Magazine, alluded to by Mr. Armstrong, was taken from one of them. Perhaps Mr. Armstrong will, at some future opportunity, give the public the "*tale*" which, no doubt, (from his mysterious mention of it,) must be highly important and interesting.

I remain, Sir,

Your most obedient servant.

JAMES OLDHAM.

Hull, July 22d, 1840.

RECENT AMERICAN PATENTS.

[*Selected from the Franklin Journal.*]

IMPROVEMENT IN CHURCH AND OTHER BELLS, AND IN HANGING THE SAME, *Ebenezer Dewey.*—This bell is a cone, a section through the axis of which would present

a right angle at its apex, its diameter at its base being equal to twice its height. "The diameter at the mouth of the bell is forty lines, and the thickness of the lip is one line, and one-third of a line in thickness at the top, and half a line in thickness at one-third the distance from the base or mouth to the crown, and gradually diminishing in thickness from thence to the crown." These dimensions, it is said, may be changed. This bell is not intended to swing like the ordinary church bell, but it is attached to a cross timber which hangs on gudgeons at its ends, to allow a free vibration and motion to the bell. The hammer strikes on its outside, its handle being affixed to a shaft which turns on gudgeons, and which stands parallel to, and above the timber by which the bell is suspended; this shaft has a pulley on its end to which the bell rope is attached, and in ringing, the hammer may be carried clear over from one side of the bell to the other. A spring on each side serves to hold the hammer clear of the bell after the stroke.

Claim.—"I claim the gradual diminution of the thickness of the sides of the conical bell from the lip at its base to its apex or crown, in the manner above described; and also the combination of the yoke and shaft containing the hammer handle and the spring, in the manner and for the purpose above described."

Improvements in Steam Boilers, and Apparatus to Prevent Explosions thereof, *Cadwallader Evans.*—In the apparatus described in the specification of this patent, there is a very skilful arrangement and adaptation of the respective parts for the purpose of preventing explosions. The fusible alloy is to be used, combined in a particular way with the common safety valve, and in such manner as to leave the valve free to act by the ordinary pressure of the steam; the alloy being intended to regulate the opening of the valve by the influence of temperature alone, irrespective of the pressure of the steam. The claim in this part is to the particular manner in which the combination is made between these parts.

To give notice of the descent of the water to a point below that of safety in either of the outside boilers in a series of boilers like those used on our western waters, a float is so used as to allow of the escape of steam, which is to sound a whistle on one side and a horn on the other, which shall distinctly indicate the fact, and the boiler in which the water is deficient. The particular combination for effecting this, is claimed.

A water level of a peculiar construction is made so as to exhibit, in the cabin, the level of the water in the boiler, operating by its combination with the other parts of the apparatus in producing this result.

Press for Hay, Cotton, &c., *Chas. W. Hawkes.*—In this press the follower is to be brought down upon the hay, cotton, or other article contained in the pressing box, by means of a rack and pinion; to which, of course, no claim is made, the claims being confined to certain special arrangements intended to facilitate the operation; these consist in the mode of employing a lever to clear the follower from the interior of the box; a method of fastening the doors, &c.; these may be conveniences in this kind of press, but they do not require special description.

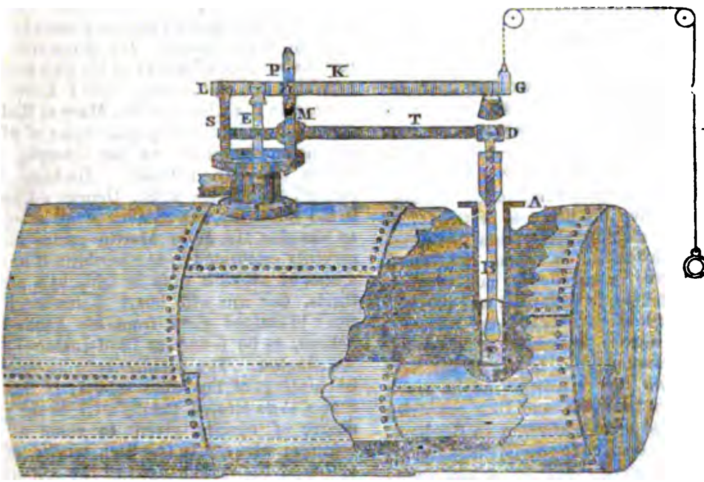
Improvement in Scales for Weighing, *Jonathan Ball.*—These scales are of the kind in which the dish to receive the article to be weighed is above the beam. The beam is a graduated rod having sliding weights upon it, by which to ascertain the weight. The arrangement is undoubtedly new, and it is clearly described. The claims are to "the manner of constructing and combining the balance frame and movable graduated bars as above described."

Manufacturing the Leaves of Steel Springs for Carriages, *Micah Seabury.*—The object in view is to give the proper taper and width to the leaves of springs, by means of a rolling mill constructed for that purpose. The two rollers are made eccentric, to the extent required for the taper of the springs to be rolled; and at the ends of these rollers there are grooves which constitute edging rollers, by which the plates are to be reduced to, and kept at, the proper width. The manner of forming them is fully described in the specification, and the claims made are to "the method described of giving to the metal to be made into springs the proper width, in combination with the method of giving the proper thickness and taper." There is but little of novelty in all this, the taper of springs having been given precisely in the manner set forth; but it is not known that they have been rolled to a width on the same rollers.

DESCRIPTION OF A SELF-ACTING SAFETY VALVE, INVENTED BY MR. JOHN P. BAKEWELL, OF PITTSBURGH.

The present invention consists in a method of fastening and securing the pivot end, or turning point, of the beam, or lever, of a common safety valve, in such a manner that the heavier the weight may be which is placed upon the opposite or long arm of the lever beam, for the purpose of keeping the valve

closed—the more certain and effectual shall be the operation of the apparatus in opening the valve, whenever the boiler shall have been heated to such a degree of temperature as may be considered dangerous, or liable to become so; which may be done as follows, and is best explained on reference to the accompanying sketch or drawing of the same.



A, a metallic pipe or tube, which is to be placed within and securely fastened to the boiler with its lower end resting upon the flue, (or the bottom of the boiler if made without flues.)

B, a metallic rod or stem, constructed with an enlargement at one end, and connected, with a right and left screwed collar, to a piece made with a pivot hole at D.

E, the safety valve, made as usual, G K L lever beam.

F, a suitable quantity of the fusible metallic compound enclosed in a thin metallic cup, which is loosely connected at the top with the rod B, so that it can be taken out of the pipe A, if required, by raising the rod.

S T, a bent lever connected at L with the short end of the lever beam—turning in a slot at M, and connected with the upper part of B at D, and having an opening through which the stem of the safety valve passes freely without touching.

M, a standard or upright attached to the upper casing of the safety valve, and constructed with a slot to admit the free motion of S T, and with cheeks or guides above, which loosely clasp the lever beam; the bottom of which slot is filed to an edge, and is to be about one-half an inch below the bottom of the lever beam, as seen just below *n*.

It will be seen that the fusible metal will sustain the rod B and lever S T, as long as it shall remain unfused, and consequently serve as the support for the pivot end of the lever beam, G K L.

And that as soon as it becomes fused, it will allow of the descent of the rod B, and as soon as the lever beam touches the standard M at *n*, the action of the lever is reversed, and it must exert the same power to open the valve as was before exerted in holding it down.

To replace the apparatus, it will be requisite that whenever notice is given from the escape of steam that the boiler has become so much heated as to fuse the alloy—that the engineer should raise the lever beam by means of the usual lift line V, until it touches a bolt or pin P, which is passed through the cheeks of M, and at the same time withdrawing the stem from the melted alloy, and holding it there until the alloy is sufficiently cooled, either from the escape of steam or from cold water having been poured within the pipe A, so as to enable it to sustain the stem as at first.

The double right and left screwed collar is intended for the purpose of regulating the proper position of the lever S T, and connexion at L.

The claim is as follows, viz:—

"I claim as my invention, the attachment of a rod or stem (B) to the end of the lever or beam, of a safety valve, *in such a way*, that it shall be the fulcrum, pivot, or turning point of the beam, as long as the alloy remains unfused; and, I claim the placing of a standard or upright (M) between the safety valve and the weighted end of the lever to

which the beam shall shift its fulcrum or pivot wherver the alloy shall become fused or melted." The patent is dated December 21, 1839.—*Journal of the Franklin Institute.*

ON THE PRESENT STATE OF THE ART OF GLASS PAINTING IN ENGLAND AND FRANCE, AND ON THE NECESSITY FOR EFFORTS IN ITS FAVOUR.—BY GEORGE GODWIN, JUN., F.R.S. AND S.A.*

To bring together and relate the circumstances attending the progress of the art of painting and staining glass, from the foundation of Constantinople, where it attained a certain degree of excellence, and whence, there seems reason to believe, it was brought to Rome, and afterwards by our Norman, if not our Saxon, ancestors to England, would be a pleasant task, but as all the facts are well known, the repetition might prove tiresome. In the 14th and 15th centuries the art reached great perfection in England, and ultimately became so popular that stained glass was not merely used for ecclesiastical purposes, but as an essential feature of decoration in domestic architecture. At the Reformation the onward progress of glass painting was checked, and many fine specimens of it were destroyed as evidences and encouragers of superstition. Further ravages were made in the reign of Charles I., and during the continuance of the Commonwealth; indeed it seems surprising, bent as the Puritans were upon its destruction, that so much yet remains,

"Innumerable of stains and splendid dyes.
As are the tiger-moths deep damask'd wings,"

to prove its power in exciting holy emotions; "to add new lustre to religious light," and a further charm to the many inherent beauties of those numerous buildings in the pointed style of architecture scattered over England, of which we have just right to be proud.

Dallaway in the first edition of his "Observations on English Architecture," † gives a valuable list of the various professors of the art of painting on glass, who practised in England from the period of the restoration of the reigning family up to the year 1805, when Francis Egington died—a man of celebrity in the exercise of the art, who had been established near Birmingham.

A little time previous to this date, Charles Muss came to London to obtain employment as a colourer of prints. He lodged at the house of an individual who painted upon china for Messrs. Mortlock, and was induced by accident, on the death of his landlord, to undertake the completion of some work of this description which had been left unfinished. Succeeding in this he became a china painter, and ultimately a glass painter, and was employed in that capacity for many years by Mr. Collins, of the Strand. He afterwards executed a number of works in his own name—of which one of the finest that I know is a window in the Church of St. Mary at Redriff. Muss had a number of pupils, some of whom are now practising: as for example, Mr. Nixon and Mr. Hoadley. Backler, who painted the window at St. George's Church in the Borough, was another of his scholars, as was also Mr. John Martin—since so deservedly celebrated in another branch of art: a man of whom it may be said, in a parenthesis, our age will boast hereafter,† A work in stained glass from his hands is, I believe, to be found at Lord Listowel's, at Kensington. The peculiarity to be observed in paintings of the Muss school, (I think t may also be termed the *defect*,) is the great degree of opacity given to some of the colours; whereas in the best works of the artists of the middle ages all the colours are more or less translucent. Of all Muss's living pupils Mr. Nixon, of the firm of Ward and Nixon, has perhaps most entirely abandoned this peculiarity, and the result apparent in such of the works executed by this firm as I have examined, is of an exceedingly satisfactory nature,

Dallaway says that Thomas Jervais, who died in 1801, was the first who was distinguished for exquisitely finishing small subjects, since which time this department of the art has been much studied and has been brought to a point of great excellence. In productions of this sort a variety of colours are fused into the same piece of glass, and it becomes almost impossible to obtain with such certainty equal effects of colour, as when each tint is on a separate piece of glass, although this style has undoubtedly its own advantages. In the works of the earlier manner the colours are nearly always on separate pieces, the various morsels being united by leaden or copper bands, and shaded with brown. A hardness of outline resulted, and a great excellence in drawing was not easily attainable, but there is nevertheless about them a character peculiarly their own which should not willingly be lost in decorating ecclesiastical structures of the style of the middle ages. Of course we should not give up the power we possess through our improved mechanical skill, to avoid injurious joinings where this can be done without di-

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* Abridged from a paper read at the Royal Institute of British Architects, June 1, 1840.

† London, 1806.

† "It is only when we are skeletons that we are boxed and ticketed, and prized and shown."—*W. S. Landor.*

minution of excellence in other respects; what I would simply express is, my conviction that to endeavour to make stained glass appear to be anything else than stained glass is not desirable.

Mr. Willement, whose works are well known to all who have inquired into the subject, is justly celebrated for his imitations of the efforts of the earlier artists in stained glass, and of these no other example need be given than the principal window in St. Dunstan's Church, Fleet-street, executed by him a few years since. This window was presented to the parish by the Messrs. Hoare.*

In France at this time the art of painting on glass is making satisfactory, although but gradual, advances. During the period of the first revolution the abhorrence of every thing connected with royalty which prevailed, led to the suppression of the government establishment for the manufacture of glass and china at Sevres, and to the destruction of numerous fine specimens of its skill. While many glass windows were broken and melted down in the vain belief that as gold was employed in the preparation of some of the colours, it could be extracted and made available. Buonaparte sought to re-establish the manufactory on its former footing, but found that, although they possessed all the written details of the processes, France which had produced so many noble works in stained glass, and the most perfect existing history of its progress and manufacture, was unable then to furnish artists capable of regaining for the establishment any of its former reputation. The art however was still exercised, but so little progress was made that prior to the year 1825, the practice of it appears to have been confined to this royal establishment at Sevres, fame, not profit, being the object aimed at, and even there great success does not seem to have attended their efforts, if we may judge from the following circumstance. A window of painted glass was completed at Sevres in 1827, for the church of *Notre Dame de Lorette*, and when fixed, which did not occur until some years afterwards, in consequence of the building remaining unfinished, it was declared to be a *chef d' œuvre* of modern art. In less than eighteen months however, as I am informed by a correspondent, the colours had faded so considerably as to render the window a public monument of failure, and permission to take it down was in consequence applied for. The dampness of the building was the cause assigned for the mishap, but insomuch as the carcase had been erected many years, this could not have been very excessive; and whether so or not, this failure could not have occurred had the colours been properly fused into the glass.

We have said that, prior to 1825, the art of painting on glass was nearly confined to the establishment at Sevres. In that year Monsieur le Comte de Chabrol, then Prêfet of the Seine, entered into correspondence with Mr. Jones, a pupil of our countryman, Charles Muss, already mentioned, the result of which was that Mr. Jones went to Paris with the intention of forming a government establishment for painting upon and staining glass, in which pecuniary profit was to be regarded as a main consideration. Immediately on the arrival of Mr. Jones, M. de Chabrol was virulently attacked for affording encouragement to a foreigner "to the injury of native talent," and for four years the question was violently agitated without any result. At the end of that time, fatigued by the continued opposition to which he had been subjected, Mr. Jones abandoned the idea of a government establishment, and devoted his energies to forming and carrying on with success a private undertaking, He proposed to the proprietors of the glass works at Choisy le Roi, two leagues from Paris, to establish a department for staining and painting on glass, in conjunction with the other operations. They assented to his views, affairs were put *en train*, and success has attended the attempt. Nearly all the persons at present employed in it have been educated to it by Mr. Jones, and, in consequence, work well together, a circumstance which, in connexion with the opportunities he possesses for making experiments at small cost, and the comparatively trifling expense of the recipient in France, places stained and painted glass within the means of a much larger class of persons there than it is in England. Green, blue or red glass, for example, may be bought in Paris for 1½ franc per foot, purple for 2 or 2½ francs, and ruby for 3 francs. Progress in the art of staining glass appears to have been greatly aided by M. Bontems, the director of the works at Choisy, who has devoted much time to the attainment of the ruby coloured glass of which such magnificent specimens are to be found in earlier works. I am informed he has succeeded, after repeated experiments, in obtaining it at a much cheaper rate than formerly by the use of oxide of copper instead of oxide of gold, and without any diminution of excellence. The experience of English glass stainers is opposed to this statement, as all ruby co-

* Although this paper does not pretend to give the names of *all* the professors of glass painting practising in England; (unfortunately necessarily few), the writer cannot omit to mention Mr. Millar, who has executed a number of works at Stonyhurst, and Mr. Wilmshurst whose large production "The Field of the Cloth of Gold" was destroyed by fire.

loured glass prepared here from copper is inferior.

The establishment at Choisy possesses an advantage in the friendly co-operation of some artists of talent, not glass painters. In order to render a design effective on glass, such changes and alterations from the original picture are sometimes necessary, as would be entirely objected to by painters nervously careful of their fame, so that it is sometimes difficult to find artists of ability willing to exert their talents for the purposes of glass-painting, as they must be subservient in a certain degree to him who has the execution of the work, and on whom of course depends the effect to be produced. The last works exhibited in Paris by the Choisy establishment were designed by M. Adolphe Fries, a warm friend of the undertaking, and obtained much commendation.

Circumstances are much more favourable in France to the progress of the art of glass painting that they are in England. The material is so much cheaper, and the remuneration expected by artists for their labour is so much less, even after making all allowances for the difference in the value of money in the two countries, that the greatest obstacles in the way of experimental essays amongst us do not exist there.

It is really to be desired that some efforts will shortly be made in England by men in authority, to prevent the decay of an art so beautiful and so valuable as this which we are now considering. Its present languid state is most deplorable to behold, and cannot but terminate fatally unless means be taken to inspirit and invigorate those who are engaged in it. It is not asked that government should form large and expensive establishments for this purpose, as at Munich, such a course is not necessary, perhaps, even, it would be unadvisable; but it does appear exceedingly desirable that they should, by occasional commissions and discriminating assistance, draw public attention to the subject, raise the hopes of its professors, and offer some inducement for increased exertion on their part. In consequence of the improved state of chemical and physical science, we have the means of producing works in painted glass superior to anything that has yet been done, were proper encouragement afforded to develop our resources; unfortunately, a directly contrary opinion prevails, and this fact, therefore, cannot be insisted on too vehemently.*

* It may be remarked here, that care should be employed by painters in the selection of glass for their works. Glass, as now made for ordinary purposes, is ill-suited for painting on. A few years ago, admirable glass for this object was obtainable from a factory at Dumbarton, which is not now in operation.

Concerning the importance of stained glass—

> "Glass of thousand colourings,
> Through which the deepened glories once could enter,
> Streaming from off the sun like seraphs' wings."

to increase the solemnity of an ecclesiastical building, and induce holy and religious feelings—apart from its influence as a work of art—none disagree; and yet, in consequence of the niggardly and ill-advised system of church building pursued at this time, few of the new edifices which are rising in all directions—mean, contracted, and poverty-stricken—afford any specimens of it. If government were to set an example by the bestowal of a few windows, there are many individuals and public bodies who might be persuaded to follow it.

Let us hope that better times than the present are in store for the lovers of this particular art—or rather, let us *not* be contented with simply hoping, but diligently set our own shoulders to the wheel, and vigorously assist to bring about that which we all admit to be so desirable.

PROSPECTS OF STEAM NAVIGATION.

A Pamphlet has recently appeared on the present Position and Prospects of Steam-Navigation,* the writer of which—for his impartial and unflinching investigation of all the facts bearing upon the question, the soundness of his views, the justice of his inferences, and the conclusiveness of his arguments—deserves the approbation of all persons who feel the slightest interest in this great national question.

We have made the following gleanings from this highly interesting work, and regret that our space does not permit of more copious extracts; but, we console ourselves with a conviction, that the perusal of the subjoined will send many of our readers to the pamphlet itself.

Early Difficulties.

"It is not less astonishing than true, that from the very first establishment of steam navigation, an active spirit of persecution has been at work against the proprietors and commanders of steam boats; and that spirit appears to have gained strength, in proportion as this important branch of national industry against which it was directed, has been developed and extended. We may excuse the unlettered watermen on our rivers, for joining in the cry against steam boats, to

* Statement illustrative of the Position and Prospects of Steam Navigation in 1840. London: Ridgway, Piccadilly; and Richardson, Cornhill. pp. 86.

which they attribute the decay of their own occupation, though it may be doubted, whether, as a body, they have in any way been injured by the substitution of the steam-paddle for the feathery oar; in the same way we may overlook the petulance of the veteran skipper, who sees his own craft distanced in the race, by a power, the very idea of which, would, in his younger days, have been received with incredulity and derision; but, it is not to such humble individuals as these, that the prejudice here alluded to has been confined; the public press has but too frequently lent its powerful aid to foster the evil feeling, which, on this, as on many other occasions, the public have manifested against their best benefactors; and, even those who make, and those who administer our laws, have, on more occasions than one, allowed themselves to be carried away by vulgar clamour, and have joined in the general outcry against a new description of shipping, to which it is more than probable, in case of another maritime war, that this country will be mainly indebted for the inviolability of her territory, and the security of her commerce. Even our courts of justice have seldom failed to lend themselves as instruments of oppression, whenever the owner or commander of a steam boat has been brought under their jurisdiction. The most frivolous actions brought against a steam boat company, for damage done, or alleged to be done, to any other description of vessel, have almost invariably terminated in verdicts for the plaintiff; indeed, so invariably has it been the practice, both of judge and jury, to look with a jealous and hostile eye upon every owner of a steam boat that appears before them in the character of a suitor; so constantly have their decisions manifested a foregone conclusion, that the various companies have long been in the habit of submitting to the most gross attempts at extortion, rather than expose themselves to the additional fine, almost certain to be imposed upon them in the shape of their own bill of costs, and that of their antagonists.

Should the company, confiding in the justice of its cause, venture to go into court,—judge, jury, counsel, and witnesses, are found prepossessed by a strong and habitual opinion, that the blame must lie with the steamer; and the newspaper reporters, catching up the tone of the assembly, foster the popular prejudice, by vieing with each other in harrowing descriptions of the "awful recklessness" of the captains of steam boats, and of the "frightful waste of human life," daily caused by their misconduct. Nay, on one occasion, when the force of evidence went so strongly in favor of the steam boat, that judge and jury appeared doubtful whether they ought not to depart from their customary practice; an eminent barrister very gravely urged it as a legal axiom, that "the court could never do wrong, in case of doubt, if it decided against the steamer; and this monstrous appeal to vulgar prejudice, which ought to have been rebuked by the judge, produced the full effect on which the advocate had calculated; the indecision of the jury was at an end, and the unoffending steamer, as usual, was subjected to the double punishment of a heavy fine for the alleged damage, and of a second fine, in the shape of the plaintiff's costs.

Reasons and Motives for Enquiry.

The popular prejudice, though it is one one that must eventually yield to the irresistible force of reason and truth, is one that continues at present in active operation; it is one that has imposed frequent burthens upon a new and most important branch of national industry; one that, if not checked, may suceed in throwing very serious impediments in the way of the further development of our maritime greatness. This popular prejudice, fostered by a most extravagant exaggeration of occasional accidents, inseparable from navigation generally, and of much more frequent occurrence among our common merchant vessels than among steamers, led in the early part of last year to the appointment of a government commission, charged with the investigation of the number and nature of the accidents, that had occurred to, or been occasioned by steam boats, and with the task of suggesting practical means for preventing the recurrence of similar misfortunes. The Commissioners were utterly unacquainted with steam navigation. They undertook their office, no doubt, with an honest desire to act with perfect justice towards all parties; but men are themselves rarely conscious of the extent to which their judgment may be influenced by the prevailing tone of popular opinion. From the very nature of their appointment they commenced their inquiry, obviously for the purpose of collecting a huge mass of evidence against the proprietors of steam boats generally. All their questions tend to this object, and it is, therefore, little to be wondered at, if in the 233 pages comprised in their report, an apparently formidable show of facts is arrayed against those who may be looked on as the immediate objects of the work.

There is no man absurd enough to suppose that the ocean will ever be navigated without some risk to the navigator. Improvements in navigation may lessen, but can never wholly do away with the dangers of the sea. The adoption of steam, as shall presently be shown, has materially diminished the number of shipwrecks, and has enabled

a much more extensive commerce and intercourse to be carried on by sea, at a much smaller expense of human suffering and human life; but steam has certainly not yet made the seaman so perfectly master of the element, as to secure him against the danger of tempests. shoals, and rocks, or against the consequences of his own imprudence. There is no talisman that can secure a steamer, more than one of her Majesty's frigates, from striking against a rock; a fire at sea is an awful calamity, whether on board a steamer, or on board of a sailing packet; and if a worn-out hulk be sent over a stormy sea, there is imminent danger of her being lost on the passage, whether she be steaming with pigs from Ireland, or sailing with timber from Canada.

Results of Enquiry.

Let us turn to the report of Messrs. Parkes and Pringle, and we shall see what the number of accidents may be, which the industry of those gentlemen has enabled them to ascertain.

By their instructions, they were directed to confine their inquiry to a period of ten years, but in the course of their investigations, they obtained so much information relative to preceding years, that they have included within their schedule of accidents, all that they could ascertain to have happened since the first introduction of steam navigation into this country. The following table presents an abstract of this schedule :—

	Number of British Steamers then in existence.	Number of Steamers wrecked.	Collision	Steamers burned.	Bursting of Boilers.	Imminent peril*	Number of Lives lost.
1817	14	none	none	1	1	—	9
1818	19	none	none	none	none	—	none
1819	24	none	none	none	none	—	none
1820	34	none	none	1	none	—	none
1821	59	none	none	none	none	—	none
1822	85	none	none	none	none	—	none
1823	101	none	none	none	none	—	none
1824	116	none	none	none	2	—	3
1825	153	1	1†	none	1	—	62
1826	230	none	none	1	1	—	6
1827	255	1	none	none	1	—	2
1828	274	2	none	1	2	—	1
1829	289	3	none	none	1	1	6
1830	298	3	none	none	1	1	*
1831	324	2	2	1	none	1	119†
1832	352	none	none	none	none	—	none
1833	387	6	none	1	none	1	73‡
1834	430	2	none	1	1	—	§
1835	503	3	1	1	1	1	13
1836	561	2	4	2	1	1	1
1837	707	2	2	3	1	—	29
1838	766	5	2	none	6	1	132‖
1839	no return	3	none	none	2	3	5
		35	12	13	22	10	461¶

The forgeoing table presents an abstract of a schedule of 92 accidents, all that the government commissioners could ascertain to have occurred since the first introduction of steam navigation into this country; but of these 92 accidents, only 22 can properly be

* This column is here introduced, because many of the accidents enumerated in the report, are so described by its authors. A moment's reflection, however, will convince any one, that on this point no information of any real value could have been obtained. Every vessel at sea is in *imminent peril*, the moment that bad weather comes on, or that the captain and crew relax in their vigilance.

† This was the collision of the *Comet* and *Ayr*, in the Clyde river; the most serious accident of the kind that has ever occurred. On this occasion 62 lives were lost.

* The *Frolic* was lost in this year on the Naass Sands, when all on board perished; but the precise number is not known. None of the other accidents this year were attended by loss of life.

† These were all lost near Beaumaris, in the *Rothsay Castle*.

‡ This does not include those lost in the *Erin*.

§ In this year the *Superb* was lost, in a tremendous hurricane in the North Sea. All on board perished. This ship was known to be in a most perfect and complete state. None of the other accidents this year were attended by loss of life.

‖ This was by far the most unfortunate year that has ever occurred since the application of steam to navigation. During this year the *Killarney*, the *Northern Yatch*, and the *Forfarshire* were lost, and the *Victoria* twice burst her boilers.

¶ In addition to these, it is computed that 120 lives were lost in the *Erin*, *Frolic*, and *Superb*.

said to have been occasioned by steam, for shipwreck, fire, and collision at sea, are calamities inseparable from navigation; calamities that have certainly occurred much less frequently to steamers than to sailing vessels. Twenty-two explosions of boilers, attended by the loss of 77 lives, form, therefore, the whole sum of the indictment which can be brought against Steam Navigation, after a diligent inquiry extended over a period of twenty-three years! There is surely nothing in such a result, to justify stringent legislative enactments; but, our readers shall judge for themselves.

Dangers if tested by comparison.

To estimate the comparative security of steam navigation, we must inquire what losses have been sustained by our common merchant marine, and on this subject we find some melancholy information ready to our hands, in a Report laid before the House of Commons, a little better than three years ago. In March, 1836, Mr. Buckingham prevailed on the House to appoint a select Committee, "to inquire into the causes of the increased number of shipwrecks, with a view of ascertaining whether such improvements might not be made in the construction, equipment, and navigation of merchant vessels, as would greatly diminish the annual loss of life and property at sea." Before this committee a great number of witnesses were examined, and the report founded upon their testimony, commences with the following startling announcements:—

1. That the number of ships and vessels belonging to the United Kingdom, which were wrecked or lost in the periods specified below, appears, by a return made to the Committee from the books at Lloyd's to be as follows:—

Number of Vessels Stranded or Wrecked.

1816..................	343	1833..................	505
1817..................	362	1834..................	454
1818..................	409	1835..................	524
	1,114		1,573

Number of Vessels Missing or Lost.

1816..................	19	1833..................	56
1817..................	40	1834..................	43
1818..................	30	1835..................	30
	89		129

Making a total of 1,203 ships or vessels wrecked and missing in the first period of three years, and a total of 1,702 wrecked and missing in the second period of three years.

The result of this report, is to show that three millions of property and a thousand human lives are annually lost by shipwreck! This is a fearful statement, in comparison with which, the casualties enumerated in the report of Messrs. Parkes and Pringle sink into insignificance; at all events, even the most sceptical, when they compare the two accounts together, must feel satisfied of the great security of steam navigation. It may be argued, by some, however, that the greater extent of our mercantile marine is sufficient to account for the greater loss of life and property. Such is not, however, the fact. According to Mr. Porter's tables, Great Britain and her Colonies, in 1836, owned 25,800 vessels, of an aggregate tonnage of 2,800,000. In 1835, the number of vessels registered was 25,511. In that year, as we have just seen, by Mr. Buckingham's report, 554 vessels were totally lost, being at the rate of one shipwreck for every 46 vessels afloat. During the same year, seven accidents, according to Messrs. Parkes and Pringle, occurred to steamers, and only *one* of those accidents was attended by the loss of life. In 1835, the number of British steamers afloat, not including the Colonies, was 503, only one in 72, therefore, met with a serious accident. The account between steamers and sailing vessels for 1835, stands, accordingly, thus:

One out of every 46 sailing vessels afloat that year, was completely lost;

To one out of every 27 steam vessels then afloat, a serious accident occurred.

Much has been heard of late years of the insecurity of the river Thames, in consequence of the rapidity with which steam boats are navigated in our crowded Pool. It cannot be denied that many melancholy accidents *have* been occasioned on the river by steam boats, and the most serious of them, the collision with the *Tyrian*, is still fresh in the memory of all; but it may safely be maintained, that the number and character of these accidents are greatly over-estimated by the public at large. The Waterman's Company, of London, furnished Messrs.

Parkes and Pringle, the Government Commissioners, with a list of the accidents to boats, barges, &c., that had occurred on the Thames, from May, 1835, to December, 1838, being a period of three years and six months, and, of this list, the following is a digest:—

Number of persons drowned, or otherwise killed, by steamers upsetting boats, &c. &c. ..	43
Number of persons who sustained bodily injuries	5
Number of persons thrown into the water, but saved from drowning	72
Total personal accidents	120
Number of wherries, barges, smacks, or other craft, sunk and injured by steamers	59
Number of steamers seriously damaged by collision with each other	12
Total accidents to vessels............	71

The destruction of 43 human lives, can awaken no other feeling than one of deep regret; but when the immense traffic carried on by steam along the Thames is taken into consideration, it may be questioned whether the public could reasonably have expected a smaller amount of disasters, or whether we are entitled to anticipate greater security from any legislative enactments that have ever been proposed. What the precise extent of that traffic may have been during the three years and a half included in the statement of the Waterman's Company, it is impossible to say, but we have data, from which a computation may be made, on the approximate accuracy of which, some reliance may be placed. From the accounts taken at the government dock-yard at Deptford, it appears that the number of steam boats that pass weekly amount to .. 700

Multiply this number by........ 52

We obtain, as the number of steam boats passing annually up and down the river, before the dock-yard at Deptford...................... 36,400

By multiplying these by........ 3½

We obtain as the probable number of trips up and down the Thames, during three years and a half 127,400

Consequently, only one life appears to have been lost for every 3,000 trips performed by steamers up and down the Thames in three years and a half; and even if we include the 72 individuals whose sufferings extended no further than immersion into the water, still we have not quite one personal accident for every thousand trips performed by steamers on the river Thames. It may be doubted whether a thousand sailing vessels ever go up and down the river, without occasioning a greater number of disasters.

Policy of Government Interference.

Messrs. Parkes and Pringle found that a certain number of accidents had occurred to steam vessels, and they seem to have adopted the Utopian notion, that, by the introduction of a cumbersome and intricate machinery, of commissioners, surveyors, registrations, classifications, and licenses, the recurrence of accidents might, to a great extent, be avoided.

These gentlemen recommended a long series of proposed legislative regulations, all apparently planned with a view to the creation of a formidable staff of commissioners, surveyors, licensers, and clerks, to be paid by fees levied on the proprietors of steamers, who of course, must look to recover any such additional outlay, either by an increased charge on the public, or by some saving in the construction or equipment of the vessels.

If greater security were obtained by the survey and classification of vessels therein proposed, the public might be indemnified for the tax imposed upon them; but the Report of the Commissioners totally fails to show that any such advantage would be the result. The Report shows, indeed, that in the course of a certain series of years a number of melancholy accidents have occurred to steam-vessels, and that some of those accidents have been attended by a deplorable destruction of human life; but the Report does not presume to argue, that the adoption of the whole intricate machinery which it recommends would in any way secure us against the recurrence of disasters equally deplorable. Whether ships will ever be constructed, in which man may defy the power of the elements, may fairly be doubted; at all events no owner or captain of a steamer has ever been so presumptuous as to arrogate for his own vessel any such absurd distinction. Naval architecture has greatly improved during the present century, and to this improvement steam navigation has unquestionably contributed; but the real office of the machinist is not so much to improve naval architecture, as to apply the power of steam to the propelling of such vessels as the present state of the art may place at his disposal. He must introduce his machines into such ships as the ship-builder can produce; and, up to the present day, no ship has been built that is not liable to shipwreck, fire, and the other calamities inseparable from the seaman's profession.

Only in one instance has fire on board a British steamer been attended by the loss of human life. The case of the Medway, which occurred in 1837, when two lives were lost, is here alluded to. Yet fire, it might naturally be supposed, is among those calamities to which steam-boats are more particularly liable. No culpable carelessness, therefore, can be made out

other on their starboard sides, but in many against the proprietors or commanders of steam-boats, so far as fire is concerned.

With respect to shipwreck, it is a calamity to which steamers are liable in common with all other vessels. We have seen that, during a period of 23 years, since 1817, 33 British steamers have been wrecked; during the same period the same calamity has probably occurred to more than 15,000 sailing vessels belonging to the British mercantile marine. We will select a few instances of shipwreck, of a much more awful character than any that have ever occurred to steamers, but to which, comparatively speaking, very little public attention has ever been directed.

The *Lady of the Lake*, from Belfast to Quebec, was wrecked in 1833, on which occasion 170 lives were lost.

In the same year the *Amphitrite*, convict ship, on her passage to New South Wales, was wrecked off Boulogne, when 136 lives were lost.

The *Astrea*, from Limerick to Quebec, was wrecked near Cape Breton, in 1834, when 237 lives were lost.

The *George III.*, from London to Hobart Town, was lost near the Derwent, in 1835, when 134 lives were lost.

Here we have four cases of shipwreck, occurring within a few months of each other, attended by a greater loss of life than Messrs. Parkes and Pringle could ascertain to have occurred from all the steam-boat accidents that had happened since the first introduction of steam navigation into England.* Can any stronger argument be requisite to show the comparative security of steam-vessels? And what beyond *comparative* security can be hoped for? Complete security no one can presume to anticipate; and it may even be doubted, whether the most onerous and vexatious interference with the property of the several steam-boat companies will ever succeed in obtaining even a trifling increase of security to the public.

No legislative interference can ever supply the absence of vigilance and good conduct in the captain or engineer, or good faith on the part of the proprietor in the equipment of the vessel. The experiment has been made in America, and it has signally failed; and, if tried in England, it would prove equally fallacious. It is impossible for any Government surveyor to secure us against the use of bad materials in the construction of a vessel; but, fortunately for the public, a motive is already at work which obtains this security much more effectually. A steam-boat is a most expensive vessel to equip; and as most of the large Companies are their own insurers, the loss of a vessel is always a serious disaster to them, and one against which they are certain to use every precaution in their power; but even where a steam-boat is insured, its qualities are certain to be canvassed with the greatest care by the under-writers; and there are agents and surveyors of Lloyds at every port, ready to afford the earliest information to their employers whenever an attempt is made to insure a vessel not perfectly seaworthy. If even a periodical survey of steamers should be deemed necessary, the machinery is at hand; Lloyd's surveyors are men fully equal to the task; but really, judging from past experience, common justice demands from us the admission, that the Companies have not themselves been negligent of the duty imposed upon them by the responsibility of their position.

The only points with respect to which Parliament could interfere with any hope of advantage, are those which apply to ships of every description. It is but too certain that some of the most melancholy shipwrecks that have occurred to steamers or sailing-ships, have happened to vessels that were notoriously not seaworthy for some time before they were lost. If any simple regulation could be devised to meet instances of this description, it might be desirable that such should be adopted. Beyond this there ought to be no inquisitorial interference, or the consequence will be disappointment, for reliance will be placed on the worthless foundation of government licenses and classifications, instead of the character of the owners and commanders, which, after all, must constitute the only real security to the public.

The Right of Steam-Way at Sea.

The next point on which some legislative enactment is called for is what is denominated "the rule of the road." Strange as it may appear, there is not only no distinct law as to the side on which two vessels ought to pass one another, but the most contradictory rules prevail in different parts of the kingdom; and most of the collisions of steamers that have occurred, have been occasioned by a misunderstanding on this important point. According to the rules and regulations adopted by the Trustees of the Clyde, and according to those promulgated by the Corporation of the Trinity House, Hull, if two steamers meet, they are enjoined to *starboard*; but, according to the laws enforced in the Tyne, they must *port* their helms. The Liverpool steamers pass each other ports the practice is just the reverse. The collision between the *Royal William*

* These four shipwrecks deprived Great Britain of 677 of her children; whereas all the shipwrecks, collisions, fires, explosions, and running down of boats and barges, that the Government Commissioners were able to hear of, from 1817 to 1839, had not been attended by the loss of more than 634 lives.

and the *Tagus*, and that between the *Thames* and *Shannon*, occurred in open day; both steamers saw one another, but there was a misunderstanding as to the rule of the road; and, in both instances, an awful loss of life would have been the inevitable consequence, but for the excellent equipment of the vessels, and the skill and presence of mind displayed by the commanders and engineers.

Why Well should be let alone.

It is to the comparative liberty which steam navigation has hitherto enjoyed in this country, that the astonishing rapidity of its development may in a great measure be attributed. When we consider, however, that little more than a quarter of a century has elapsed since the introduction of this art among us, we can scarcely look upon it otherwise than as still in its infancy; and we may reasonably anticipate, when we reflect on the vast improvements yearly made, that navigation by steam is advancing towards a much higher degree of perfection than any which the most lively imagination is yet capable of picturing to us. In this art England is now in advance of every nation of the world; and history tells us, that when, in any art or manufacture, a nation has once got a fair start of all its competitors, the advantage is rarely lost, unless by the commission of some gross legislative blunder. Even so it will probably be with the art of steam navigation. In this art England now holds a pre-eminent rank; but by imposing shackles and restrictions, and by casting an unmerited stigma upon those to whose ingenuity and enterprise the country is indebted for that pre-eminence, we should be incurring the imminent risk of arresting the farther development of the art altogether, or of driving it to other shores. This is a consideration which, in a national point of view, is deserving of most anxious reflection. It is steam which will probably decide the fortune of the next maritime war in which we may be entangled; and the possession of an efficient fleet of steamers may then be found of more importance than the command of an equal number of ships of the line. Let us beware how we cast from us an advantage which we now possess in an eminent degree, and of which we shall probably continue in possession, unless deprived of it by some act of imprudence of our own.

Even within the last three or four years, steam navigation has made advances which, ten years ago, the boldest imagination would not have ventured to contemplate. Iron steamers now navigate the ocean—the last great difficulty, that of preventing the local attraction of the compass, having, after a series of scientific experiments, been completely overcome. When this material shall have been more extensively tried and proved, there is reason to expect that it may be substituted for wood, in the construction of vessels, to an extent much greater than has ever yet been contemplated, and may lead to obtaining results beyond all present calculations.

To speak of the great national triumphs achieved by our Atlantic steamers, may perhaps, appear superfluous; but it is difficult to resist the temptation of dwelling on a theme so gratifying to every Englishman to whom the naval pre-eminence of his country is dear. Steam Boats, of more than 2000 tons burthen, are now employed in the trade between this country and the United States. It was long maintained and believed by experienced and scientific men, that the Atlantic never could be crossed by steam, and still less by ships of this immense magnitude; but now

> "Each following day
> Becomes the next day's master, till the last
> Makes former wonders its."

Even now, vessels of a bulk far superior to that of the *British Queen*, are in the course of construction, with a view to their being employed as regular passage vessels. It is in contemplation to establish steamers on the Pacific Ocean, to ply along the coast of South America, and perhaps even to our Australian colonies—a state of things that would bring New South Wales within seven or eight weeks distance of the mother country. Such has been the progress of a *free* trade; but retrogression, and not advancement, must be looked for, when liberty and confidence are made to give place to suspicion and constraint. In carrying out these great experiments, in arriving at these important results, not a single life has been lost, notwithstanding the predictions of those who would have been the advocates of restraint and prohibition. Had any vexatious system of survey and classification existed, these advances would, in all probability, have been effectually checked.

In the few brief remarks here made, there has been no intention to dispute the right or policy, on the part of the legislature, to interfere for the protection of the public, where protection is really called for; but let us proceed with extreme caution in any interference of the kind; and before we attempt to shackle a new and prosperous branch of national industry, let us be assured that the measures proposed are not more stringent and oppressive than the circumstances of the case imperatively demand. An act of Parliament, embodying any regulations of the nature that have been recommended, would strike a fatal blow at steam navigation; for by lending a sanction to much of that vulgar clamour which has been raised by the envious and interested, and heedlessly fostered by the public press, it would deter the most

respectable among capitalists, and the most eminent among scientific men, from associating in enterprises on which a public stigma was cast. The direction of a most important branch of our great national marine, would thus pass into the hands of an inferior and less responsible class of men, or perhaps into those of foreign capitalists; and what is now a mighty engine for the assertion of our own naval supremacy, might become, in the hands of a commercial rival, a weapon ready at any time to be directed against us.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

Hezekiah Marshall, of Canterbury, architect; for improvements in window-sashes and frames, and in the fastening of window-sashes.—Sealed January 14.

The matters herein claimed are: firstly, an improved mode of constructing the lower sash-rail and the surface of the window-sill. That of the sash which shuts part down upon the sill is hollowed out, and along the edge of the window-sill is formed a groove, by which means wind or rain are effectually deflected from such sash-frame at that part. The second claim sets forth the application of the same principle to the lower rail of the upper sash-frame. The third improvement is a fastening for window-sashes. Several modifications are shown, but the following general principle prevails throughout. A spring-bolt working in a socket is attached to to the front sash, and is forced by the handle of a wedge into a brass mortar fixed on the opposite sash. As soon as the handle of the wedge or button is drawn aside, the bolt is withdrawn and the sash may be opened. Fourthly, there is a contrivance for preventing the shaking of window-sashes, consisting of a brass plate affixed to the sash-frame, against which a spring attached to the sash presses. The application of friction-rollers to window-sashes is also claimed; but the mode of using them is not shown.

Arthur Eldred Walker, of Melton-street, Euston-square, engraver; for improvements in engraving by machinery. Sealed Jan. 20. The inventor lays claim to a mode of engraving by a species of dies or punches, which he calls "engraving plate type." In the first instance a small steel die, with a slightly concave surface, has engraved upon it any letter, flower, or figure that may be required. This die is then hardened, and used to form a surface in relief upon the convex face of a soft steel die; this, when hardened, becomes the "engraving type" employed for striking the figure into a copperplate. In effecting this object, the steel type thus formed is placed in a suitable frame, over the plate of copper to be engraved, when a small hammer, worked by a moderate spring, strikes the steel punch into the copper. The hammer is so arranged as not to strike too hard, and the convex surface of the dies prevent their edges from touching the copperplate. By this means any workman may engrave, after the requisite dies or punches have been prepared.

Charles Wheatstone, of Conduit-street, Hanover-square, Esq., and William Fothergill Cooke, of Sussex Cottage, Slough, Esq. For improvements in giving signals, and sounding alarms at distant places, by means of electric currents.—Sealed Januay 21st.

The claim herein made, is, for improvements on a former patent; the improvement consisting in applying the attractive force of temporary magnetism for the giving of signals and alarms. A very minute description is given of the insulated wires, with the apparatus necessary at each station where signals are to be given. Metallic contact conveys temporary magnetism to pieces of iron, by means of helical coils of wire wound round them, which receive the electric current. These temporary magnets act upon small pieces of iron, favourably disposed for communicating motion to suitable machinery. Contact being broken, magnetism ceases, and the iron retracts from the previously attracting mass, assisted in its recession by small weights or springs; the slight effect of which, is overcome by the more powerful magnetic influence. The object of the present improvements is said to be, the obtaining a sufficient diversity of signals, from successive action and re-action of the foregoing arrangements, so as to carry on a telegraphic communication between distant places, where duplicates of the apparatus are situated.

In some cases two, in others three insulated wires are employed for the purpose. The mechanism made use of is a species of clock-work, very similar to the escapement of a time-piece, having a dial divided into 24 or 30 intervals, or other convenient number with some agreed letters or characters to be used for signals. The small piece of iron before mentioned, being connected with the pallet of the escapement so that the temporary magnet shall cause the hand to move over one division of the dial-plate,—the breaking of contact, and consequent suppression of magnetism, causing the advance of the hand one division further; and so, by alternately making and breaking contact at regular intervals, the hands of all the apparatus in connection with the wires, will ad-

vance upon the dials with a continuous stepping motion until the point is reached, marking the signal to be communicated, when they stop. After a determinate pause, the operation is repeated till the signal has been completed; the hand is then advanced to O, or Blank—which intimates that nothing more is to be signaled. The two poles of the apparatus are then withdrawn from the battery, and placed in contact, in order that answers or signals may be returned from the other end of the line in a similar way. Several modifications of the apparatus are very minutely described; one of them consists, in placing the characters on a revolving disc, with an aperture in the dial-face, through which, the characters are seen, as signaled. When telegraphic communication is to be held between places too distant for an electric current to be transmitted all the way with sufficient vigour, to be certain in its operation, a chain of such apparatus, is to be established at convenient intervals. Several modifications of electro-magnetic machines and voltaic batteries, adapted to the object in view, are also explained at length.

OPENING OF THE BRITISH MUSEUM AND NATIONAL GALLERY ON HOLIDAYS.

On Tuesday week last Mr. Hume divided the House of Commons, in vain, on a motion of appeal to her Majesty, that she would use her influence with the trustees of the British Museum and National Gallery, to induce them to open their treasures on Sundays, Christmas Day, and Good Friday, at such hours as the houses of licensed victuallers, the sellers of beer and gin, are legally open. The opponents mustered 82 votes in opposition to 44, against a measure which we hold to be for the moral and mental improvement of the working classes. But out-door feeling is strengthening against the eighty-two, and ere long we shall see the Museum and the National Gallery more accessible. The sensible people at Liverpool have, we observe, resolved to make their exhibition as extensively useful as possible, and therefore to admit gratuitously the stipendiary teachers and children belonging to *all the daily charity schools*, amounting to 16,130; and to prevent confusion, particular days have been appropriated for the admission of particular schools, at the rate of about 1,000 a day. An attempt has also been made, by an influential member of the New Water Colour Society, to open that exhibition gratuitously to the public for a limited period; but we regret to hear that it was opposed by a majority of the members. There was not much of novelty or force in the arguments brought forward by the spokesmen of the eighty-two. The usual cry of Sabbath desecration was the loudest heard. Some seemed to dread the increase of public houses in the immediate neighbourhood of Sunday exhibitions, as if the elevation of taste and intellect produced a sort of thirst for spirituous liquors and Sunday intoxication. Government, with its known liberality, can have but one objection to public institutions remaining open on Sundays—the increased number of attendants, or the increased duties to individuals already sufficiently employed. We are for increased numbers. We should indeed regret if Government officers could say, as Pope did, in allusion to the crowd of rhymers that pierced in through grot and thicket for the poet's approval of their verses—*Athenæum.*

Ev'n Sunday shines no holiday to me.

LIST OF DESIGNS REGISTERED BETWEEN 25TH JUNE AND 30TH JULY, 1840.

Date of Registration.	Number on the Register.	Registered Proprietor's Name.	Subject of Design.	Time for which protection is granted.
June 26	344	J. Rostron	Gambroon	1 year.
,,	345	Ditto	Ditto	1
29	346	S. Lowe	Carpet bag	1
30	347	W. H. Phillips	Chimney top	3
July 1	348	H. Longden and Son	Stove	3
,,	349	P. Wright	Axle-cap washer for vices	3
,,	350	W. J. Stone	Label	1
2	351	W. Beach	Spring for cricket bats	3
,,	352	J. Dell	Bruising and grinding machine	3
6	353	S. Mordan, senr.	Pencil case	3
7	354	Woodward Gandell and Co.	Carpet	1
15	355	W. Woods and Sons	Penholder	3
20	356	The Carron Co.	Stove	3
,,	357	S. Ackroyd	Fender	3
,,	358	Ditto	Stove	3
,,	359	Ditto	Fender	3
21	360	E. and J. Dowson	Balcony front	3
23	361	S. Butler	Cord	3
,,	362	E. H. Barwell	Stove	3
,,	363	R. Hardy and R. Padmore	An ornament	3
27	364,5	J. Yates	Stove	3
,,	366	I. I. Hollingshead	Pen	3
,,	367	Ditto	Penholder	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 25TH OF JUNE AND THE 28TH JULY, 1840.

John William Nyren, of Bromley, manufacturing chemist, for improvements in the manufacture of oxalic acid. June 26; six months to specify.

Thomas Spencer, of Manchester, machine-maker, for a certain improvement or improvements in twisting machinery, used for roving, spinning, and doubling cotton wool, silk, flax, and other fibrous materials. June 26; six months.

William Jefferies, of Holme-street, Mile-end, metal refiner, for improvements in copper, spelter, and other metals, from ores. July 1; six months,

William M'Murray, of Kenteith Mill, Edinburgh. paper-maker, for certain improvements in the manufacture of paper. July 1; six months.

John David Poole, of Holborn, practical chemist, for improvements in evaporating and distilling water, and other fluids, being a communication. July 2; six months.

Charles May, of Ipswich, engineer, for improvements in machinery for cutting and preparing straw, hay, and other vegetable matters. July 6; six months.

Edwin Turner, of Leeds, engineer, for certain improvements applicable to locomotive and other steam-engines. July 6; six months.

James Harvey, of Bazing-place, Waterloo-road, gentleman, for improvements in extracting sulphur from pyrites and other substances containing the same. July 8; six months.

Louis Leconte, of Leicester-square, gentleman, for improvements in constructing fire-proof buildings. July 9; six months.

Joshua Taylor Beale, of East Greenwich, engineer, for certain improvements in steam engines. July 10; six months.

George Barnett, of Jewin-street, London, tailor, for improvements in fastenings for wearing apparel July 11; six months.

Joseph Getten, of Paul's-chain, London, merchant, for improvements in preparing and purifying whale oil, being a communication. July 11; six months.

William Palmer, of Feltwell, Norfolk, blacksmith, for certain improvements in ploughs. July 11; six months.

Peter Fairbairn, of Leeds, engineer, for certain improvements in machinery or apparatus for hackling, combing, repairing or dressing hemp, flax, and such other textile or fibrous materials, being a communication. July 13; six months.

Thomas Tassell Grant, Esq., an officer in her Majesty's victualling-yard, at Gosport, for improvements in the manufacture of fuel. July 13; six months.

Edwin Travis, of Shaw Mills, near Oldham, Lancaster, cotton-spinner, for certain improvements in machinery, or apparatus for preparing cotton and other fibrous materials for spinning. July 15; six months.

John Lambert, of Coventry-street, St. James, within the Liberty of Westminster, gentleman, for certain improvements in the manufacture of soap, being a communication. July 15; six months.

James Jamieson Cordes and Edward Locke, of Newport, in the county of Monmouth, for a new rotary engine. July 18; six months.

Moses Poole, of Lincoln's Inn, gentleman, for improvements in fire-arms, and in apparatus to be used therewith, being a communication. July 18; six months.

James Roberts, of Brewer-street, Somers-town, ironmonger, for improved machinery, or apparatus to be applied to the windows of houses or other buildings, for the purpose of preventing accidents to persons employed in cleaning or repairing the same; and also for facilitating the escape of persons from houses, when on fire. July 18; six months.

Francis Todd, of Pendennis Castle, Falmouth, gentleman, for improvements in obtaining silver from ores and other matters containing it. July 29; six months.

Alexander Angus Croll, superintendent of the Chartered Gas Company's Works, Brick-lane, for certain improvements in the manufacture of gas, for the purposes of illumination, and for the preparation or manufacture of materials to be used in the purification of gas, for the purposes of illumination. July 29; four months.

John Swain Worth, of Manchester, for improvements in machinery for cutting vegetable substances, being a communication July. 29; six months.

Robert Urwin, of South Shields, Durham, engineer, for certain improvements in steam-engines. July 29; six months.

John George Bodmer. of Manchester, civil engineer, an extension of an invention for the term of seven years, for certain improvements in the machinery for cleaning, carding, drawing, roving, and spinning of cotton and wool. July 29.

Joseph Burnett, of Turnler, near Glossop, Derby, cotton-spinner and paper-maker, for certain improvements in machines for cutting rags, ropes, waste hay, straw, or other soft or fibrous substances, usually subject to the operation of cutting or chopping, part of which improvements are applicable to the tearing, pulling in pieces, or opening of rags, ropes, or other tough materials. July 29; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND SUBSEQUENT TO THE 22ND JUNE, 1840.

William Neale Clay, of Flimby, Cumberland, gentleman, for certain improvements in the manufacture of iron. Sealed. June 25.

Rice Harris, of Birmingham, Warwick, gentleman, for certain improvements in cylinders, plates, and blocks, used in printing and embossing. June 25

Robert Cook, of Johnston, in Renfrewshire, engineer and millwright, for the making of bricks by machinery, to be wrought either by steam or other power. June 30.

John Hemming, of North Bank, Regent's Park, Middlesex, gentleman, for improvements in gas meters. June 30.

Thomas Richardson, of the town and county of the town of Newcastle-upon-Tyne, chemist, for a preparation of sulphate of lead, applicable to some of the purposes to which carbonate of lead is now applied. June 30.

David Morison, of William-street, Finsbury, Middlesex, ink maker, for improvements in printing. June 30.

Jonathan Sparke, of Langley Mills, Northumberland, agent, for certain improved processes, or operations for smelting lead ores. July 2.

William McMurray, of Kinleith Mill, near Edinburgh, paper maker, for certain improvements in the manufacture of paper. July 2.

Robert Stirling Newall, of Dundee, Forfar, being partly a communication from abroad, and partly by invention of his own, for certain improvements in wire ropes, and in machinery for making such ropes, which ropes are applicable to various purposes. July 2.

Charles Greenway, of Douglas, in the Isle of Man, Esq., for certain improvements in reducing friction in wheels of carriages, which improvements are also applicable to bearings and journals of machinery. July 2.

John Lothian, of Edinburgh, geographer, for improvements in apparatus for measuring or ascertaining weights, strains, or pressure. July 7.

John Swain Worth, of Manchester, in the county of Lancaster, merchant, being a communication from abroad, for certain improvements in rotary engines to be worked by steam and other fluids, such engines being also applicable for pumping water and other liquids July 7.

Thomas Peet, of Bread-street, Cheapside, Lon-

don, gentleman, being a communication from abroad, for certain improvements in steam engines. July 10.

Edward Thomas Bainbridge, of Park-place, St. James's, Middlesex, Esq., for improvements in obtaining power. July 10.

John Juckes, of Shropshire, gentleman, improvements in furnaces, or fire-places, for the better consuming of fuel. July 10.

James Harvey, of Basing Place, Waterloo-road, Surrey, timber merchant, for certain improvements in paving streets, roads, and ways, with blocks of wood, and in the machinery or apparatus for cutting, or forming such blocks. July 13.

William Henry Bailey Webster, of Ipswich, Suffolk, surgeon in the Royal Navy, for improvements in preparing skins and other animal matters, for the purposes of tanning and the manufacture of gelatine. July 13.

Alexander Bow, of Crown-street, Hutchesontown, Glasgow, Lanark, Scotland, builder, for improvements in furnaces and flues, by the introduction and application of hot air thereto, and for the consumption of smoke and economising fuel. July 14.

LIST OF IRISH PATENTS GRANTED IN JUNE, 1840.

John Inkson, for improvements in apparatus for consuming gas for the purposes of light.

NOTES AND NOTICES.

Weaving Extraordinary.—One of the most extraordinary specimens of silk weaving ever executed, was exhibited at Mr. Morrison's late conversazione given to the members of the Institute of British Architects. It was a portrait of Jacquard, representing that extraordinary man in his workshop, surrounded by his implements, and planning the construction of that beautiful machinery, which now, in its increased perfection, returns this testimony to the genius of its inventor. This work, worthily entitled, "*Hommage à J. M. Jacquard*," was woven with such truth and delicacy as to resemble a fine line-engraving: it was executed by Didier, Petit and Co. We learned that there were 1,000 threads in each square inch (French), in both the warp and the woof; and that 24,000 bands of card were used in the manufacture, each band large enough to receive 1,050 holes. Owing to the black threads passing under them, the tone of the highest light was grey, though this was scarcely perceptible. The great difficulty to be overcome was, it is said, the keeping the broad margin round the picture perfectly even in colour, and regular at the lines forming the edge of the picture.

Fires in New York.—(From an American paper.) —Between the 23d of May, 1839, and the same date 1840, 192 fires occurred in New York, being an average of 1 for every 48 houses. Of this number 96 were caused, in the opinion of the commissioners, by incendiaries, 90 were the result of carelessness or accident, and 7 of causes not ascertained. The value of property destroyed is 3,225,409 dollars. The amount of insurance was 2,963,310 dollars, or more than seven-eighths of loss.

The "Fire-King" Steamer performed, in the night of Friday last, the passage from Dublin to Liverpool in *nine hours and twenty-five minutes*, the quickest passage between the two ports on record.—*Liverpool paper.*

Spanish Improvements.—On the whole Madrid may be said to be fast improving: and those travellers who have not visited this city for some time, will be very agreeably surprised to find that great improvements have taken place, and that others are contemplated. Upwards of 30 huge convents have been, within the last four years, pulled down to make room for elegant rows of houses, bazaars, galleries, markets, and squares, with trees in the centre. A company has just been formed for the purpose of lighting the streets with gas, which they propose to extract from schist, a mineral substance abounding in the mountains of Segovia, within 40 miles; as the distance between this and the Asturias, and the state of the roads, render it impossible that coal should be used for that purpose. There are also rumours afloat of a Company about to be established for the purpose of supplying the capital with good water, an article of the first necessity in a country like this, where the thermometer generally fluctuates in the dog-days between 96° and 104°, and where a glass of *agua fresca* is reckoned the most delicious beverage. Madrid has hitherto been long so imperfectly provided with water, that, after a dry winter, the greater number of the fountains cease to flow, and the inhabitants are seriously inconvenienced.

Coal in British America.—It is said to have been ascertained by survey that New Brunswick is one of the richest coal districts in the world.

Lloyd's Register.—The utility of this register of British and Foreign shipping may be, in some degree, estimated by the fact, that there are no less than 11,595 vessels recorded in the book just published for 1840-41. Of this large number, 5,226 are classed under the letter A, 3,301 under Æ, 947 under E, 52 under I, and 2,069 have no character assigned.

Hall's Patent Reefing Paddle-Wheel.—We are happy in being enabled to state, that the spirited directors of the Hull and London Steam Packet Company are about to adopt Mr. Samuel Hall's patent reefing paddle-wheel, on board one of their finest steamers, the William Darley, of 220 horse power, at present engaged in the Hamburg trade from this port. This steamer, we understand, is most admirably adapted for the exemplification of this great desideratum of reefing the paddle-wheel, an improvement which has been loudly called for ever since the application of steam to the propulsion of ships; but hitherto attempted without practical success. No small degree of interest is excited, both in the scientific and practical world, as to the result of the reefer on board the William Darley.—*Hull Advertiser.*

Aerial Locomotion.—The Paris papers give accounts of another remarkable invention, the results of which would indeed be of a novel and very important kind, and which would seem to take one more away from the ancient list of impossible problems— that of discovering a fulcrum or *point d'appui* in the air. If this invention be correctly described, there is nothing to prevent balloons being at once adopted in lieu of omnibuses. We shall no longer think it wise to be amongst the sneerers, if perpetual motion and the philosopher's stone be once more introduced amongst the subjects of human research. M. Eugène de Fresne, the inventor of the apparatus, of which such effects are predicted, has submitted his discovery, to which he gives the name of *Moteur Atmosphérique*, to the Academy of Sciences, which body has appointed a commission for its examination. The commission is engaged in drawing up a report, and it is observed that the reporter, M. Arago, treats the inventor with great distinction. Meantime the overt experiment, of which the papers have cognizance, is the following:—A few days ago a small group of the learned and noble, which included M. de Chateaubriand, M. de Tocqueville, the Duc de Noailles, and M. Ampère, were assembled on the Quai d'Orsay, watching with great interest the evolutions of a boat of singular construction, which glided up and down the Seine with and against wind and stream, without oars or sails; and having as its sole moving power a sort of aerial wheel, where, in boats hitherto belonging to this lower earth, a sail or a steam-chimney should be.—*The Athenæum.*

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 887.] SATURDAY, AUGUST 8, 1840. [Price 3*d.*

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CAVE'S PATENT PADDLE-WHEEL.

Fig. 1.

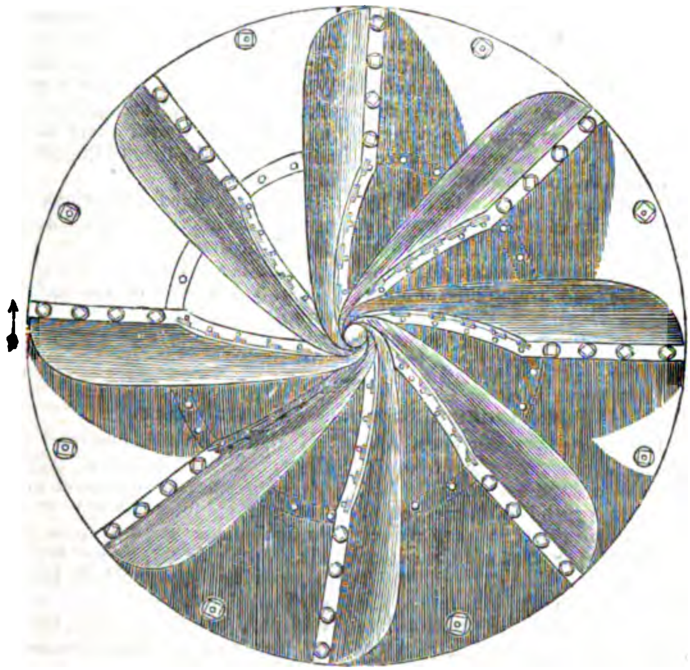


Fig. 2.

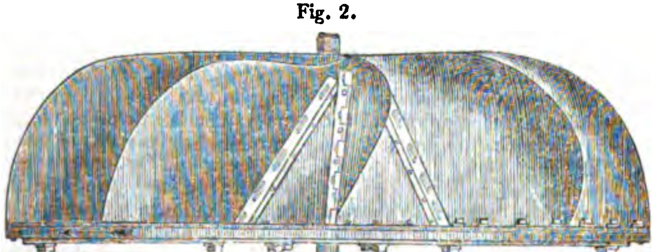
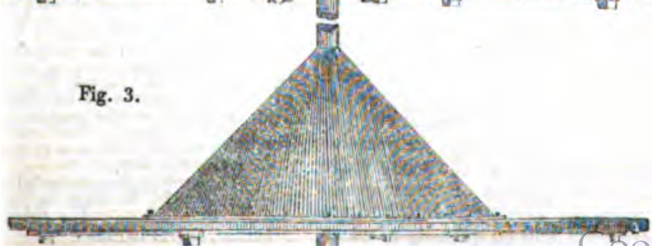


Fig. 3.



DESCRIPTION OF CAVE'S PATENT PADDLE-WHEEL. COMMUNICATED BY THE INVENTOR.

In presenting to the public my patent wheel, I am induced to say that it will effectually do away with several of the evils of the wheels now generally in use.

The wheel in question is composed of a circular iron rim furnished with ten spokes, which are fixed to the nave. The wheel is then covered with a sheet iron cone, the base of which is two-thirds the diameter of the circle; the cone is riveted firmly to the wheel, and is furnished with as many grooves as are requisite for the number of plates; these plates being attached by four screws to the disc, and four to the cones, compose the wheel. The angular position of the plates prevents that unpleasant noise and tremulous motion which the old wheel makes on entering the water; it likewise throws the water off from the vessel's sides, and for towing vessels is superior to the old wheel, as the water is warded off from the bows of the towed vessel. Another great advantage is, that my patent wheel can go much deeper than the old one, and is therefore less liable to be rolled out of the water by the motion of the vessel. When the paddles are not required, by taking off two or three plates and turning the wheel down, there will remain nothing but the disc to impede the sailing of the vessel.

In the prefixed engravings fig. 1 represents a side view, of the wheel as seen outside of the vessel.

Fig. 2 is a plan of the disc and cone.

Fig. 3 is a plan of the paddle-wheel complete.

EXTINGUISHING FIRES ON RAIL-ROADS.

Sir,—The frequent occurrence, and the heavy losses occasioned by fire in the luggage trains on the several railroads, strongly call for the introduction of some remedial measure, so as to reduce —if not the number—at least the extent of these accidents.

Captain G. Smith (the inventor of the paddle-box safety boats) in the *Railway Times*, July 4th, suggested a plan for giving warning in case of fire in a railway train, and for enabling the guards to communicate by signal a few important intimations to the engine drivers. The method by which Capt. Smith proposes to effect these very desirable objects is, to have a reflector or mirror placed on each side the engine, in front of the engine-man, to be so screened that nothing beyond the line of the train could be reflected to distract the attention of the driver. So far well; the early discovery of a fire is of the utmost importance, and this plan seems admirably calculated to effect that object. But when the fire is discovered, some means of extinguishing it becomes necessary—and under the peculiar circumstances of a railway train, we perceive a serious deficiency; at the early stage of a fire, a few buckets of water would often meet the exigency—but buckets there are none, and no quantity of water can be obtained.

I flatter myself, however, that this state of things admits of an easy remedy; my suggestion is this:—let every railway-carriage have one of Capt. Manby's Antiphlogistic Bottles (now made by Mr. Merryweather, Long Acre,) slung beneath it; neither the bulk nor weight is such as to be productive of any inconvenience. Thus equipped, the engineer by means of his reflectors, no sooner perceives by the emission of smoke, &c. that a fire is breaking out in any part of the train, than he pulls up as quick as possible, and with such assistance as may be at hand, he uncovers the ignited waggon, and discharges upon the burning mass the contents of one or more of the antiphlogistic-vessels, by which means the fire would be immediately put out, with little damage, and the train might resume its journey in safety.

At the first station which the train reaches, the engineer should hand in the empty vessels, and receive full ones in exchange, so as to be prepared for any further contingency; a certain number of charged vessels being always kept at each station for this purpose, as well as for local application.

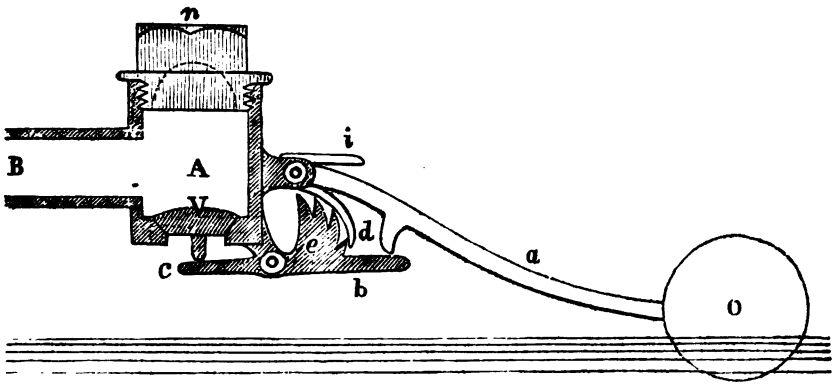
I remain, Sir,

Yours respectfully,

W. Baddeley.

London, August 1st, 1840.

IMPROVED BALL-VALVE FOR CISTERNS.



Sir,—The ball-valve described in your 65th number, being liable to the objection* pointed out by Mr. Baddeley, I hope you will excuse my taking the liberty of sending you the above sketch of a superior ball-valve I saw in a shop-window in Liverpool some time ago.† A is the valve box; B the water-pipe, and *n*, a nut, which may be removed for the purpose of taking out or replacing the valve.

Its action is as follows; when the surface of the water falls, the ball *o* descending with it, depresses the levers *a* and *b*, and the tail *c* of the latter lifts the valve V; at the same time the catch *d* falls into the ratchet *e*, and holds the valve open till the cistern is filled, when the ball raises the lever *a*, which striking the tail *i* of the catch *d*, releases the lever *b*, and the valve immediately closes. Trusting that the above sketch will make its action plain,

I am, &c.

A Reader of your Journal.

19th May, 1840.

WHITELAW'S METHOD OF WORKING STEAM-ENGINE VALVES—SUCCESSFUL APPLICATION.

Sir,—One of the steam-engines, of the Lancefield Spinning Company, Glasgow, wrought by an eccentric in the ordinary way, was deficient in speed, in consequence of its having too little power; and at the suggestion of my friend, Mr. George Whitelaw, of Messrs. David Cook and Co., engineers, here, the apparatus (see *Mech. Mag.* No. 819, vol. xxxi, page 42) which I proposed for working the valves of a steam-engine, was applied to this engine, and now it has plenty of speed, with an increase of pressure, as shown by the indicator, of 1½ lbs. on each square inch of the piston. There is no part of the engine altered, except one lever upon the rocking-shaft; and the only part added to the engine, is the link for shifting the pin, upon which the gab of the eccentric-rod gears. I write this to induce persons having the charge of factories where there are steam-engines, to imitate Mr. Hare, manager of the first-named firm, in adopting this simple plan, instead of getting new cylinder and nozles, or making some other costly alteration on their engines, when they are in need of an increase of power. I mentioned above, that the pressure on the piston, is now, 1½ lbs. greater than it formerly was, but it would be more than this, if the engine still worked at its former slow speed. Another steam-engine, working near Glasgow, is to have its valve gearing altered to my plan immediately.

I am, Sir, yours very truly,

James Whitelaw.

Glasgow, August 1st, 1840.

* The objection is, that it does not act as intended, *unless the water sink low enough to allow the ball to hang perpendicularly.*

† The ball-valve appears to be that referred to by Mr. Baddeley in our 867th number, as the invention of a plumber at Hull.—Ed. M.M.

MR. BERNEY'S PATENT CARTRIDGES.

In our last volume (page 493) we noticed some experiments made with a new cartridge, invented and patented by Thomas Trench Berney, Esq., of Morton-Hall, Norfolk, in which the shot is contained in a spiral wire case which gradually expands on its discharge from a gun, and as it expands allows the shot to escape from between the coils. On the 9th July, and two following days, another series of experiments took place at Chalk Farm, in the presence of Colonel Hawker, his son, and several gentlemen of experience in these matters, who expressed in very flattering terms, their admiration of the force and closeness of the shooting with the Patent Cartridges. Subjoined is a table of the result of the three days trials, by which the great superiority of Mr. Berney's cartridges over the old way of loading, will be at once apparent. We may observe that several shots were fired from a boat-gun, and a gun carrying a two-pound cartridge; the results of which, were equally satisfactory, but the distance being only 100 yards, scarcely one quarter of the shots were driven out of the wire cases. It was a general remark among those present, that an increase of distance, did not much vary the force and closeness of the shooting, as in most cases the cartridge wire contained a further supply of shot, which would have come out had its flight continued longer.

Distance	Double Gun 14 gauge 8¼lb. weight, 1¼oz. No. 7 Shot			Average	Duck Gun 7 gauge 16lb. weight, 3oz. No. 6 Shot			Average	
Target 2 feet 6 inches	1st Day	2d Day	3d Day		1st Day	2d Day	3d Day		
Loose charge loaded common way 40 yards.	84 80 85	121	85	91	not tried	243 121 219	184 207 213	197	
Patent Cartridge 40 yds.	175 233 240	300 319 301	412 309 213	278	426 395 284	283 371 363	333 403 370	358	6
P. Cartridge 45 yards	200 187 245	282 169 311	251 216 268	236	not 5. tried	240 335 262	327 267 342	295	3
P. Cartridge 50 yards	235 268 157	186 256 233	195 215 220	218	227 3 217 253	218 200 189	273 220 280	230	7
P. Cartridge 55 yards	not	tried	161 138 164	154	208 1. not tried	130 212 190	249 255 262	213	5
P. Cartridge 60 yards					138 138 136	not tried	147 164 168	148	3
P. Cartridge 70 yards					250	182 430	not tried. ——	216 430	Snipe Shot
P. Cartridge 75 yards					98 123	226 131	not tried.	144	2

PROPOSED REMEDY FOR THE DISORDER LATELY PREVALENT AMONG HORNED CATTLE AND SHEEP.

Sir,—It is well known, a very serious epidemic has long prevailed in wet marshy districts among cattle, the principal exterior characteristic of which, is a soreness and affection of the feet, to that degree that the hoof frequently detaches itself from the feet of the animal. When we consider how the country was saturated with continuous heavy rains, during the principal part of last winter,

and what deluging visitations of the like kind we have had at intervals since, it is no wonder, that this complaint, which I denominate the *rot of the foot*, should have exhibited itself to an unusual extent. I would recommend to those graziers and butchers who have live stock exposed to the damp soils of the marshes of Essex, Kent, Lincolnshire, and other level localities, to lose no time in getting the said animals shod, either with iron or stout wooden shoes. We well know what an effectual preservative of health is derived from good shoes by human beings, and the same advantage may be successfully extended to brutes.

I remain, Sir,

Your obedient servant,

ENORT SMITH.

ROPE CHOPPING MACHINE FOR PAPER MAKERS.

Sir,—The late Mr. Alexander Moody, proprietor of Hawley Paper Mills, near Dartford, invented a machine (which was worked in conjunction with the other machinery) for the purpose of cutting rope; it was placed close outside the mill, and by the action of a short circular knife, about the width of a mowing scythe, used to prepare about half a ton of junk every day for the engine; when his effects were sold off, in 1824, this machine went among other things. I shall be glad to know from any of your correspondents whether they know of this or any similar machine being at present employed.* It merely required the assistance of a lad about 15 years old to urge the rope forward to meet the action of the knife, which cut it into pieces of about two inches in width. Mr. Moody was likewise the inventor of a strap that gave additional celerity to the paper machines, which he showed to several manufacturers, who highly approved of it. In short he was a most ingenious man, of whom I have already spoken, and I shall have something more of importance to say hereafter respecting him.

I remain, your obedient servant,

ENORT SMITH.

* From the list, in our last number, it will be seen that an improvement in machinery for this purpose has been recently patented.—ED. M.M.

MR. HALL'S SYSTEM OF CONDENSATION.

SIR,—Your readers must be so nearly tired with this discussion, notwithstanding its interest, that I am unwilling to swell the stream of ink that has flowed on its account. But, you will perhaps, permit me to repeat Scalpel's question to Mr. Oldham, as I am only desirous of ascertaining the truth. "In both my papers" Scalpel observes, "I have dwelt upon the *time* taken in connection with the vacuum as the criterion of power. It is the very essence of the discussion, but hitherto cautiously avoided." Mr. Hawke, and after him, Mr. Oldham, write in answer, but do not give any explanation of this, the most material point in the controversy. Surely Mr. Oldham *must* be aware that his paper in your last number, left the matter just where it was, and that though "the vacuum in the upper chamber is shown for any required length of time," as he observes, yet that until he informs us, at what part of the stroke the vacuum of 30¼ does take place there, the fact is still, "inconclusive." Let him but read, without any sore feeling for a little harmless handling, his explanation, and he cannot fail of seeing it in this light, and how much time is wasted in the mere appearance of coming to the point. I cannot, myself, see how the "real superiority of Mr. Hall's condensers over the common condensers," can be shown to give more power to the engines (for unless Mr. Oldham means *that* his observation is nothing to the purpose), by a mere gauge of the condenser vacuum, or indeed by any thing but the "Indicator," which alone can tell us the *effective* power; and it appears, by the diagram furnished by Mr. Oldham himself, that no such encrease of power does take place. He will find on the contrary that a good injection engine will show an equal or better mean vacuum than Mr. Hall's. In M'Naught's diagrams, 12·81, is stated as the mean—the vacuum in the condenser being only 29; while 12·3 is the mean of Mr. Hall's, and the vacuum 30¼. It would, I think, be difficult to find evidence more conclusively establishing Scalpel's statements, of the "slowness" of surface condensation; and that the better vacuum in the condenser, is no criterion of an equal superior power of the engine as still insisted on. As regards Mr. Hawke's ingenious observations upon the steam passages, they cannot account for the slowness of the process, because the same remarks apply equally to injection engines, and might be urged with equal force, as an apology for no better vacuum in the cylinder of such engines. It is besides unnecessary to point out that, unless a better cylinder exhaustion can be obtained by surface, Scalpel was quite correct, in affirming a loss of power, on

account of the pumps supplying the condensers.

I agree with "Pioneer," that "Scalpel" is entitled to our thanks for pointing out the error of Mr. Hall's system. It is a pity, however, so many excrescences should have been allowed to grow out of the main question; though as regards what was advanced in derogation of Mr. Watt, I was much pleased to find it refuted by Scalpel, and so elegantly *and truly* as to add to the gratification. I cannot but think, that Mr. Oldham rather lays himself open to the charge of self-complacency, in treating such a writer so slightingly. Without any facts in the first instance—depending solely upon his own powers—opposed to a host of certificates on the other side, many from engineers of eminence—and meeting on the moment every question that sprung out of the discussion—whether to show the fallacy of the opinion of the Edinburgh Reviewer, or to make more clear the genius of Watt—Mr. Oldham *must* see that Scalpel is no despicable opponent. I would suggest then, to Mr. Oldham's consideration, before saying so much upon "the language and style of Scalpel"—as if they were nothing but of the coarsest description, to read Scalpel's admirable paper in the 882d Number—compare it with the best in opposition, and then just to consider this simple fact:—that even in his first paper, Scalpel stated in language the most simple and distinct, the broad principles of surface and injection condensation, and explained with equal minuteness why the latter was superior, supporting his theory by a letter from the greatest authority, Mr. Watt. Now admitting parts of his paper, to be too jocular for the subject, the general principles he laid down, and the authority of Watt, were at least entitled to attention. "Another Pioneer," certainly the most talented of his opponents, met with respect and argument, the same paper which Mr. Oldham denounces as "ungentlemanlike," and which he, then dismisses with this, not very courteous or gratifying comment, even to the humblest of writers: "that any further notice of him or his statements was unnecessary." Scalpel met Pioneer, in the same courteous strain he had chosen; and if he replied with severity to Mr. Oldham, this gentleman had in my opinion, not only brought it in a great measure upon himself by his previous remarks, but had further laid himself open to censure for advocating Mr. Hall's cause, with the same kind of statements Scalpel had before so properly reprobated.

I am, Sir,

Your obedient servant,

A LOOKER ON.

London, 3d August, 1840.

P. S. It must be so evident, that it is scarcely necessary to remark, the contradiction in Mr. Hall's last paper, where he first agrees with Scalpel, that the barometer is no test of the power of the engines; and then a little lower down, asserts that "it proves *incontestably the considerable encrease of power;*" merely, because it shows so little difference between the top and bottom chambers of the condensers. Mr. Oldham commends this paper in the highest terms. I wish, therefore, it had been more intelligible to plainer capacities, for I confess I cannot understand it, especially, as both have forgotten to state *the time* of the appearance of the vacuum in relation to the stroke.

OF LONG AND SHORT CONNECTING RODS.

Agreeably to our promise we again return to Mr. Seaward's excellent pamphlet. Having in our last number* disposed of the comparative advantages of long and short stroke steam engines, we now extract so much as relates to long and short connecting rods.

"A very erroneous opinion appears to be entertained by some persons, respecting the comparative advantages of long and short connecting rods; they imagine that when a short connecting rod is employed, as in the Gorgon Engines, there must ensue not only a much greater quantity of friction and wear, but also a direct loss of a considerable portion of the mechanical power of the engine.

"We will pass over for the moment, the question of increased friction, in order to draw attention to the more important allegation of the direct loss of power; and here we may be permitted to express astonishment that in an age when mechanical knowledge is so widely diffused, there should be any persons of supposed correct information in these matters, who can entertain a notion so perfectly absurd and groundless, as that any arrangement of long and short rods, levers, or cranks, can occasion any direct loss of mechanical power, independently of that occasioned by friction.

"There was a time when many persons deluded themselves with the idea, that by a certain arrangement of long or short rods, levers, cranks, &c., they could actually produce power, or obtain an increase of power; but though this folly is happily explodedit seems only to have given place to another error equally irrational and absurd; for it is perfectly demonstrable, that while on the one hand, no arrangement of levers, rods, or cranks will produce or give power, so on

* Vide page 186.

the other hand, no mechanical arrangement whatever can be productive of a loss or diminution of power — the same reasoning which establishes the one fact, being equally conclusive in establishing the other. Not however to dwell upon generalities, we will at once point out a ready mode of deciding the question, as regards the long and the short connecting rod; namely, by giving a geometrical investigation of the powers actually exerted by two rods, the one long, and the other short, in turning the crank of a steam engine.

The connecting rod of a Gorgon Engine is usually made about three times the length of the crank, that is, for a two feet crank (or four feet stroke) the rod will be six feet long; whereas the rod of a beam engine is usually four and a half times the length of the crank, that is for a two feet crank, nine feet long.

Let the line A B (fig. 1) represent the crank of a Gorgon Engine, and B C the connecting rod, three times the length of the crank.

Fig. 1.

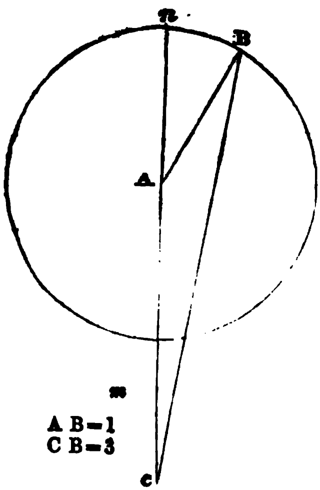
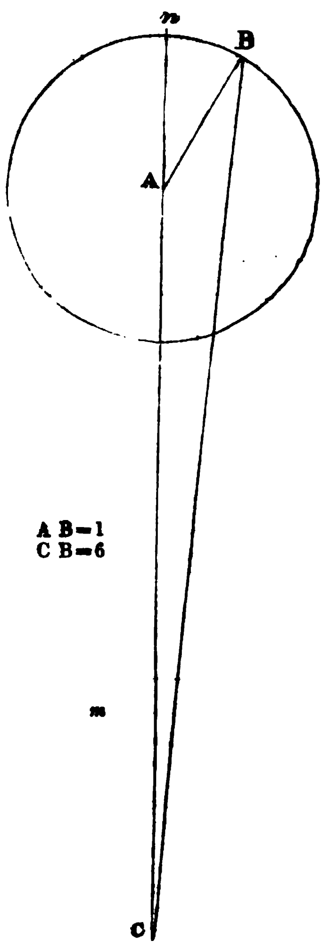


Fig. 2.



Then suppose A B (fig. 2) and B C respectively to represent the crank and connecting rod of a beam engine, and let the connecting rod be as much as six times the length of the crank. Assume, moreover, the power of the piston to be as 1000, and that

it is exerted in the perpendicular line *n m* in both cases.

It should be observed that in beam engines the lower joint C does not move in a vertical straight line, but in the arc of a circle; this circumstance is productive of considerable irregularity, which is not here taken into account.

Now, as the strain upon the connecting rod is known to vary as the secant of the angle A C B, and as the power of the rod to turn the crank in its path varies as the sine of the angle A B C; therefore, if we multiply the power of the piston, *i. e.* 1000, by the secant of the angle A C B, and by the sine of the angle A B C, and divide the product by the square of radius, this will give the power of the connecting rod to turn the crank at every point of its rotation. And if we make this calculation for every 10 degrees of the rotation, beginning at *n*, then will the powers be found as expressed by the figures in the two columns of the annexed table, which are calculated for one half the rotation of the crank; one column representing the powers exerted by the short connecting rod, and the other column those by the long connecting rod.

Now, if we compare the two columns of figures we shall find that they certainly differ, but, nevertheless, by adding together the whole of the powers exerted by the two connecting rods respectively, during one entire rotation, or during one half rotation, they both give the same actual amount, thereby clearly proving that there can be *no* loss whatever by using a short connecting rod,

Angle of crank.	Effective force of turning round the crank, by a connecting rod only three times the length of the crank as in the "Gorgon" Engines. Power of Piston as 1000.	Effective force of turning round the crank by a connecting rod six times the length of the crank. Power of Piston as 1000.
Degrees.		
0	000	000
10	117	145
20	234	288
30	354	428
40	475	560
50	596	683
60	715	793
70	827	885
80	925	956
90	1000	1000
100	1045	1014
110	1053	994
120	1017	939
130	936	849
140	811	725
150	646	572
160	447	396
170	231	202
180	000	000
	11,429	11,429

The second objection brought against the short connecting rod, is the increase of friction thereby occasioned. Now as regards the actual friction upon the two joints B and C, there is unquestionably some truth in the assertion; for in the first place, there is an increase in the strain upon the short connecting rod as compared with that in the long connecting rod; the strain, as already stated, being as the secant of the angle A C B. Again, the greatest angle formed with the vertical by the short connecting rod is 19° 28′, while the greatest angle formed by the long connecting rod is only 9 36′, and the secants of these two angles are as 106 063 to 101 420, that is, as about 23 to 22 or a difference of about one-twenty-third. But this difference occurs only at the extreme angles, for at the vertical points, the strain in both connecting rods is manifestly the same; therefore, taking the entire rotation, the strain on the two connecting rods will differ only about one-forty-fifth, and the quantity of friction upon those two joints is certainly not more than about one-twentieth of the entire friction of the engine; consequently the increase of friction caused by the extra strain on the short connecting rod is

only about one-nine-hundred part—a quantity so exceedingly insignificant as to be practically of no consequence.

"However, besides the trifling increase of friction caused by the extra strain, some allowance must be made for the increased angular motion about the joint C of the short connecting rod, which angular motion is double that of the long connecting rod; but the quantity of friction on the two joints B and C, as before stated, cannot be estimated at more than one-twentieth of the entire friction of the engine; and of this quantity only one-tenth is due to the joint C, because the joint B revolves through a complete circle or 360 degrees, while the joint C moves only in an angle of less than 20 degrees, that is, one-eighteenth part of the former; therefore the increase of friction occasioned by the increased angular motion of the short connecting rod upon the joint C will only be a two-hundredth part of the whole, which quantity added to the former, makes an addition of one-hundred and sixty-sixth part of the whole friction of the engine; a quantity much too small to be considered in the light of a serious objection to the principle of the Gorgon Engine.

"But it has been assumed that the joint C in the beam engine moves up and down in a vertical line the same as in the Gorgon Engine; this, however, is not the case, for it moves in the arc of a circle, which adds materially to the angular motion of this joint in the long connecting rod of the beam engine. Besides, this joint has also a very great addition to its angular motion in consequence of the angular motion of the beam on the main gudgeons. It is therefore capable of easy proof that the quantity of motion on the joint C of a beam engine is considerably greater than that in the Gorgon Engine with a connecting rod of half the length. True, there are in the Gorgon Engine the joints L, M, and H, of the parallel motion, which also give a certain amount of friction; but, on the other hand, there are in the beam engine the much more objectionable joints of the side rods and of the main gudgeons, the friction of which is considerably greater than that of the parallel motion of the Gorgon Engine. On the whole, it can be shown that there is much less friction on all the joints above enumerated in the Gorgon Engine than in the corresponding joints of a beam engine with a connecting rod of double the length."

PROPOSAL FOR A NEW QUART AND BUSHEL MEASURE, IN WHICH ALL FRACTIONS OF INCHES ARE AVOIDED.—BY T. N. PARKER, ESQ. A.M.

The size of the gallon now proposed, as compared with such as have been from time to time adopted, is unobjectionable.*

Winchester Measure.

	Gallon in Cubic inches.
Ale	282
Wine	231
Grain, &c.	269 8-10ths
3	781 8
Average	260 6
Imperial (dry and liquid)	277 2
Proposed ditto ditto	256

The proposed new gallon approaches nearer to the average of the three descriptions of Winchester gallons than the imperial gallon does, being only 4 and 6-10ths cubic inches less, and the imperial gallon being 16 and 6-10ths cubic inches more, than the said average.

I would renounce altogether the cylindrical measures, as standards, not being easily reducible to cubic inches;† and I propose to substitute in their stead the most simple combinations of cubes, half cubes, and double cubes, as thus:—

	in.		in.		in.		cub. in.	*Shapes of measures.*
Quarter pint	2	×	2	×	2	=	8	cube.
Half pint	4	×	2	×	2	=	16	double cube.
Pint	4	×	4	×	2	=	32	half cube.
Quart	4	×	4	×	4	=	64	cube.
Half gallon	8	×	4	×	4	=	128	double cube.
Gallon	8	×	8	×	4	=	256	half cube.
Peck	8	×	8	×	8	=	512	cube.
Half bushel	16	×	8	×	8	=	1024	double cube.
Bushel	16	×	16	×	8	=	2048	half cube.
Double bushel	16	×	16	×	16	=	4096	cube.

	cub. in.
* The contents of the gallon in the Exchequer was	270 4
If derived from the bushel	266 1
If derived from the quart	279 8
If derived from the pint	276 9

† Cisterns in which the process of malting is carried on are at present required to have rectangular sides, for the purpose of gauging their contents, respecting a tax which amounts to several millions annually.

The proposed new bushel of 32 quarts has a property which attached also to the Winchester bushel: namely, its depth being divisible into 32 distinct parts, quarters of inches, or quarts: but this circumstance is practically of no use, as the bushel should contain 32 quarts, neither more nor less.

The advantages of this new bushel are, that its capacity happens to be just what might be wished; and the great facility of subdividing it into 32 quarts, or cubes, or cubes of 4 inches, readily subdivided further into pints, half pints, &c. if required.

I had long thought that the bushel should have rectangular sides; but the dimensions of 16 by 16 and by 8, so obviously convenient (for the division or multiplication of its parts, without any fraction of an inch,) but recently occurred to me.

The standard measure of extension having been fixed by Act of Parliament with great care, so that a yard measure is minutely defined, and consequently its parts, it might be sufficient for the measures of capacity to consist of even numbers of cubic inches, without having recourse again to fresh scientific derivations and tests, which become complicated and impracticable when applied to measures of capacity.

As to the measure of extension—5th Geo. IV, c. 74, sec. 1: "Distance between the centres of the two points in the gold studs in the straight brass rod now in the custody of the clerk of the House of Commons, where the words and figures 'standard yard 1760' are engraved, and 62 degrees Fahrenheit's thermometer, is the imperial standard yard."

Sec. 3. "the imperial standard yard, when compared with a pendulum vibrating seconds of mean time in the latitude of London in a vacuum at the level of the sea, is in the proportion of 36 inches to 39 inches and one thousand three hundred and ninety-three ten-thousandth part of an inch;" that is, as 36 is to 39.1393.

This scientific description of the measure of extension does not in the slightest degree embarrass its practical application; because copies are so easily made, that every common rule is sufficiently accurate for all ordinary purposes. But instead of placing the measure of capacity under the provisions of the measure of extension, the Winchester bushel is described in the following manner: 13 Will. III. c. 5, sec. 28, "it is hereby declared, that every round bushel with a plain and even bottom, being made $18\frac{1}{2}$ inches wide throughout and 8 inches deep, shall be esteemed a legal Winchester bushel, according to the standard in his Majesty's Exchequer."

The Winchester bushel is well defined as to its interior diameter and depth, but no simple and practical dimensions are given of its parts; and the cylindrical form occasions the fraction of a cubic inch at the outset in the contents of the bushel itself.

The imperial bushel of 32 quarts is equal to 33 quarts of the Winchester dry measure, with a difference only of one part in 3700; and the imperial bushel contains a fraction of 4-10ths of a cubic inch (2150.4 cubic inches) without any definition of its depth and diameter, or practical description of its parts.

The proposed new measure, on the other hand, is divisible, without fractions, to such an extent that a pint of wheat weighing 15 ounces will contain 32 cubic inches; divisible still further by four, and by four, to two cubic inches, and lastly by two, to a single cubic inch, without fractions.

A peck measure of 8 inches cube, equal to 512 cubic inches, and a quart measure of 4 inches cube, equal to 64 cubic inches, would cost but little; and no further expense need be incurred by any one on account of such alteration in the standard measure.

The cylindrical half-bushel having been adjusted to the proposed standard, might still be used in bagging grain, and otherwise, if more convenient than the rectangular measure: cylindrical vessels might also be used for liquors, as no one would be obliged to drink out of a cubical quart: it would only be required that the quantity sold should answer to the measure intended.

If a cylindrical vessel be sought equal to a given cube, multiply 1.1283791 by the side of the cube or square, which will give the area of a circle very nearly equal to the area of the square: as thus—

$$\begin{array}{r} 1.1283791 \\ 4 \\ \hline 4.5135164 \end{array}$$

whereby the diameter of the cylinder is found to be $4\frac{1}{2}$ inches, and an insignificant fraction; and four inches being intended as the depth or height of both vessels, you have a cylindrical quart 4 inches deep by $4\frac{1}{2}$ inches diameter, equal to the quart of four inches cube.

In like manner, a cylindrical measure, equal to a peck of 8 inches cube, will be 8 inches in depth by 9 inches in diameter.

The half-bushel is the most convenient, and consequently the most usual measure; and it will be found that a cylindrical half-bushel of 8 inches in depth should be full $12\frac{3}{4}$ inches diameter, nearly half a cubic inch too small: and a cylindrical bushel of 8 inches in depth, should be full 18 inches diameter, rather more than $1\frac{1}{2}$ cubic inch too small. The double bushel, consisting of a cube of 16 inches, would be equal

to a cylindrical measure of 16 inches in depth and full 18 inches diameter, or a fraction of about one-twentieth part of a cubic inch more in the diameter.

A system of decimal divisions, it has been said, would be best as to money; but in weights and measures of capacity it appears most convenient to divide by fours; and there was no reason for departing from the old-established divisions, upon which, indeed, the proposed improvement rests exclusively.

The proposed new measure of four inches cube for a quart, and of 8 inches cube for a peck, is either totally good or totally bad, for the principle admits of no modification whatever.

I am not aware of any sufficient reason why the whole civilized world might not be brought to agree to some such measures as this quart and bushel, to be subdivided and multiplied as above described, and based on a general scientific standard of extension; whereby all articles of foreign and domestic barter, which could be conveniently measured by extension, capacity, or weight, would at once become uniform and invariable.

I would, however, wish it to be clearly understood, that the proposition of this new measure of capacity is entirely limited to dimensions of cubic inches, and that it has not of necessity any reference whatever to weights of grain, or other articles.

DESCRIPTION OF THE "NONSUCH" IRON PASSAGE BOAT PLYING ON THE LIMERICK NAVIGATION, BETWEEN THAT PLACE AND KILLALOE.—BY CHARLES WYE WILLIAMS, ASSOC. INST. C. E.—TRANS. INST. CIV. ENG.

The attention of Mr. Williams having been attracted to the successful plan for the conveyance of passengers adopted on the Glasgow and Paisley Canal, where light sheet-iron boats of great length travel at a speed of nine miles an hour, he was induced to attempt the introduction of the same system on the Irish canals. A great difficulty, however, presented itself, as the locks there would only admit boats 60 feet long, which length was quite inadequate to the carrying out with advantage the principle involved in the long light Scotch boat. To overcome this difficulty, he constructed a sheet-iron boat, 80 feet long and 6 feet 6 inches wide at midships, having the stem and stern ends (each 10 feet long) attached by strong hinges to the body, and susceptible of being rapidly raised to a vertical position by means of winches; thus reducing the length to 60 feet when required to pass through a lock. It is evident that by this means there would be gained not merely the apparent additional buoyancy of 10 feet at each end of the boat, which from the form would not be very effective, but in reality the buoyancy due to an addition of 20 feet of the midship section. The boat thus constructed has been found to answer perfectly; the buoyancy is equal to that of the Scotch boats of similar dimensions; no crankness or unsteadiness accrues when the ends are raised; it is capable of carrying 60 passengers, travelling at a speed of 9 miles per hour, with the same power that was required to draw a 60 feet boat with a less load, and there is a much less action on the canal bank in consequence of the increased length, which at the same time imparts stiffness, and enables passengers to enter and leave the boat with safety. Considerable time is saved in passing the locks, by the opposition of the square end when the bow is raised; the boat may thus be run almost at full speed into the lock, and both ends being raised simultaneously, it is stopped much more easily than if the tapered ends were down. No provision is necessary for keeping the ends down, as the weight of the bow and steersman answers the purpose.

This boat has been working without intermission for three years between Limerick and Killaloe, traversing twice daily a distance of 15 miles, on a navigation of considerable intricacy, and passing 11 locks, without any accident having hitherto occurred.

Mr. Parkes observed that, independent of the advantages of carrying more passengers, by continuing the midship section to the length of 60 feet, considerable speed was gained by the 80 feet boat, in consequence of its fine entrance and run. Mr. Williams informed him that the velocity was found to depend on the position of the boat on the wave; that the rider of the horses employed in towing the boat knew exactly the proper position of the wave with respect to the boat, and regulated the exertion of the horses accordingly—the velocity of the boat and the tractive force depending on the relative position of the boat and wave.

Mr. Field, in reply to some remarks respecting the effect of these raising ends on the buoyancy of the boat, stated that he did not understand it to be Mr. Williams's design to obtain additional buoyancy thereby. The ends only press on the water as much as is due to their own weight, and are principally useful in giving a fine entrance and run to the boat; thus having the whole space between the rising ends for the accommodation of passengers, and obtaining an absolute gain of the whole space that is lifted at each end, as in a boat of the ordinary length there must be the same tapering of the bow and stern ends. So great is the facility in ma-

naging the ends, that on quitting a lock the bow end is lowered as the gates are opening; the boat is set in motion at the same time, and as it moves on the stern end is let down, and the usual speed is obtained very soon after it clears the lock. When the lock is to be entered, the boat is suffered nearly to reach the gate at full speed, when the bow end being raised, the additional resistance caused by the square section being suddenly opposed to the water stops the boat almost immediately. The weight of one man at each end is amply sufficient to keep down the ends when the boat is in motion.—

A MODE OF BENDING DISCS OF SILVERED PLATE GLASS INTO CONCAVE OR CONVEX MIRRORS BY MEANS OF THE PRESSURE OF THE ATMOSPHERE.—BY MR. JAMES NASMYTH.

The difficulty of obtaining large specula for telescopes, together with the disadvantages attending the weight, the brittleness, and liability to oxidation, of the speculum metal generally used, induced Mr. Nasymth to turn his attention to the employment of silvered plate glass for telescopic purposes, as it possesses perfect truth of surface, is lighter than metal, is not liable to oxidation, and a greater quantity of light is reflected from it than from any metallic surface.

To give a concave or convex form to a disc of plate glass, a certain pressure must be made to act equally over the surface. This equal pressure is obtained on Mr. Nasymth's plan, by taking advantage of the weight of the atmosphere.

A disc of silvered plate glass, 39 inches in diameter and $\frac{8}{10}$ths of an inch in thickness, is fitted and cemented into a shallow cast-iron dish, turned true on its face so as to render the chamber behind the glass perfectly air tight; by means of a tube communicating with this chamber, any portion of air can be withdrawn or injected.

To produce a concave mirror so slight a power is required, that on applying the mouth to the tube and exhausting the chamber, the weight of the atmosphere, which amounts in this case to 3558 lbs., acting with equal pressure over a surface of 1186 square inches, causes the glass to assume a concavity of nearly three-quarters of an inch, which, in a diameter of 39 inches, is far beyond what would ever be required for telescopic purposes. On re-admitting the air, the glass immediately recovers its plane surface, and on forcing in air with the power of the lungs, it assumes a degree of convexity nearly equal to its former concavity. The degree of concavity or convexity may be regulated to the greatest nicety, and it is proposed to render the degree of concavity constant by placing in the air-tight chamber a disc of iron turned to the required form, and allowing the pressure of the atmosphere to retain the glass in the form given to it by its close contact with the iron disc.

The curve naturally taken by the glass when under the pressure of the atmosphere is believed by Mr. Naysmith to be the catenary, inasmuch as its section would be the same as that of a line suspended from each end, and loaded equally throughout its length.—*Trans. Inst. Civ. Eng*

NOVEL CRICKETING—A RUN BY STEAM.

Sir,—As an old subscriber may I intrude upon your columns to give a brief notice of a trip made by a party on Monday last, July 27th, by steam upon the *common road*, not in order to evidence the powers of the carriage, because I am aware that ours was but a trifling run compared with what it has performed, but, for the sake of the novelty of the thing merely—a *cricket club* going to the ground by *steam*.

A few tradesmen comprising the Stratford Cricket Club, waited on Mr. Hancock and solicited the loan of one of his steam carriages to convey us to our play; with that good feeling which has gained him the esteem of his neighbours, Mr. Hancock, without hesitation granted our request. Having duly equipped ourselves with those things necessary for our friendly combat with our rivals, we, eleven of the Stratford club, with twenty-one visitors, some of whom had never ridden by steam before, got upon the *Automaton* at the Harrow Inn, and had a most pleasant run to the Forest, at the rate of 16 miles an hour. Although we were a company of thirty-two, on a carriage having seats for only twenty-two, yet all went right. We played our game and won, had our dinner and our song. We then rejoined the *Automaton*, which performing at the same speed home as it did out, set us down at the Factory gate at 11 o'clock, highly delighted with our trip. After tendering our sincere thanks to Mr. Hancock for the loan of the carriage

"Each took off his several way,
Resolved to meet some other day."

Never having heard of a cricket match and steam being connected, I thought I would trouble you with this "tale of truth," and hope, for the gratification of the members of our club, who are admirers of your

magazine, that you will therein put our day's excursion upon record.

Your obedient humble servant,

BOWLER.

Stratford, Essex, August 1st, 1840.

P.S. I forgot to mention that of the numbers who came to see our play, more were occupied in viewing the conveyance that brought the players to the field than the players themselves, but we put up with this personal neglect with tolerable good humour.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

Alexander Holt, of Gower-street, Bedford-square, surgeon; for certain improvements in the arrangement and construction of fire-grates or fire-places applicable to various purposes.

The patentee in this case claims several arrangements, &c. by which he is enabled to economise heat and fuel. To effect this, the grates are made with false or hollow sides and backs, the under part or hearth being also made hollow: a pipe admits the external air which passes along or around these cavities and becoming warmed is permitted to enter the apartment. In a second arrangement, the cold air is made to traverse a series of heated pipes extending across the upper part of the grate and placed in about the same situation as the register-plate of a common register stove. The smoke and heated vapours in proceeding from the fire into the chimney pass between these pipes and thereby raise the temperature of the air contained within them, which when warmed is admitted to enter the apartment as before. Applications of the same principle to stoves for burning anthracite coal, and to kitchen grates are also shown, as also a new modification of a kitchen stove in which the flue is made to pass through the water boiler and thereby more effectually communicate heat thereto.—Rolls Chapel Office, July 21st, 1840.

Charles Rowley, of Birmingham, stamper and piercer, and Benjamin Wakefield, of Bordesley, machinist; for improved methods of cutting out, stamping, or forming and piercing buttons, shells and backs for buttons, washers or other articles, from metal plate, with improved machinery and tools for those purposes.

The first improvement is a new mode of constructing screw fly-presses, by placing a second screw perpendicularly below the first, the one being right, the other left handed, so that being moved by a continuation of the handle downwards, motion is communicated simultaneously but in opposite directions, thereby pressing from above and below at the same instant.

Another modification which is described, consists in producing the same effect by means of a lever placed beneath the press-bed, which by its connection with the screw, moves with, but in an opposite direction to it, and therefore presses above by the screw, and below by the lever at the same time and with equal force; in either of these cases the materials are acted upon by two tools, an upper and a lower one, both moving within a suitable tube or collar.

The operation of this arrangement is exemplified by its application to the production of four-hole brace-buttons. The upper tool or punch first cuts out a circular disc of the proper size from a sheet of metal, carrying it down a collar placed within the ordinary press-bolster, where it is met by the lower tool carrying four small punches, which pierce out the four holes—the upper tool forming the matrix to the four lower ones; the metal being pressed between the two tools receives the particular dished form that is considered suitable.

Another arrangement of mechanism for the same purpose, is described as composed of two powerful levers acting above and below simultaneously, by the rotation of a crank furnished with suitable cams, springs, &c., whereby proper tools cut out and finish any required article of the kinds mentioned, from sheets of metal; steam or other suitable power being used as a prime mover. The same principle is also shown as applied to the common stamping machine, wherein the descent of the stamp or ram, furnished with projecting sides or wedges, entering between the arms of two right-angled levers, causes an upward motion of the lower tool as in the former cases. When the stamp is raised the two lever-arms are drawn together by springs, which depresses the lower tool.

The machinery and processes hitherto described, relate only to the cutting out and finishing the upper and under surfaces of the articles operated upon. Another apparatus is described, by which their edges are nicely rounded off and finished; it may be described as a conical box with grooved interstices, and a corresponding grooved roller traversing within it; the buttons or other articles being dropped into apertures in the box are carried round in the grooves and delivered with the edges very beautifully finished.—Rolls Chapel Office, July 21st, 1840.

Samuel Brown, of Finsbury Pavement, civil-engineer, for improvements in making casks, and other vessels of, or from iron and other metals.

The patentee claims in the first place the invention of making casks and other vessels

from iron, steel, or other sheet metal: and secondly, certain machinery for performing different parts of the process or processes necessary for effecting the same. The cask is formed of a parallelogram of sheet metal, turned up into a cylindrical form, with an ordinary lap-joint. The head of the cask is formed of a circular piece of metal, cut out and turned up all round the edge; this being forcibly driven into the cylindrical barrel, has rivets placed at intervals of four or five inches all round, which are riveted through the barrel and through the turned up edge of the head. The other end of the cask, called the moveable head, is made like the first, but attached in a different manner; in this case, projecting ears of metal (tin-plate being preferred) are riveted at proper intervals around the cylinder; the heads of these rivets being within the cylinder, serve as stops to prevent the head of the cask from being driven in too far. This second head being forced into its place, the ears are bent down upon the edge of the cylinder and over the raised edge of the head, thereby retaining it firmly in its place. The joints are to be made perfectly fluid-tight with any of the ordinary paints or cements.

The machinery described for performing some of the processes, consists of the following:—Cutters, furnished with parallel guides and gauges, for cutting the sheet metal to the size of the cask intended; levers, for bending up the two edges in an uniform manner to make the lap-joint; bending apparatus, consisting of three parallel rollers placed in an angular position for giving a cylindrical form to the sheet metal, their distance apart being regulated by the size of the cask required—the closer the rollers the smaller the cylinder, and *vice versa*; cutting out dies and punches for the heads, the only peculiarity of which, is the undulatory surface given to the punch, so as to cut but a small portion of the disc at once, and to get what workmen call a "shear cut," which is sometimes (and we think better) obtained by giving the tool an angular face, as regards the bed—evidently a much simpler affair to make, than the undulating surface, to say nothing about sharpening; a series of dies and punches for bending up the edges of the heads: apparatus for cutting out and punching of handles proposed in some cases to be affixed to casks and other vessels; a lever with projecting apparatus at the side for punching the rivet-holes in the edge of the cylinder and also in the raised edge of the heads. The arrangements are many of them simple, ingenious, and apparently well adapted for the purposes intended.—Enrolment office, July 21st, 1840.

James Hall, of Glasgow, upholsterer, for improvements in beds, mattrasses and apparatus applicable to bedsteads, couches and chairs. The objects of the several inventions herein set forth, are to afford the greatest comfort to invalids under the most discomforting circumstances. The principal object is to afford ready and convenient means for the patient to perform the necessary evacuations without quitting the bed; for this purpose, improvements (*i. e.* holes) are made in the feather-bed and mattrasses, filled up, when not in use, with air-tight elastic cushions; when needful, these are taken out and replaced by a conductor which fits tightly into the feather bed, and terminates in a tapering tube leading to a receiver placed below. The upper part, or ring of the conductor, is guarded by a cushion of the sof'est description. Two small receivers (slop-pails in miniature) are placed in a mahogany frame mounted on castors, traversing in a guide under the bed, so that by moving a lever, or handle, either receiver may be brought beneath the conductor. The next contrivance is a chair-back, or support, padded and shaped to the form of the patient's back, so as to support him or her in an erect position in the bed, with the smallest possible fatigue. There is also an ingeniously contrived table, to which the patient may sit up and eat, read, write, or play at cards. The manner of applying the conductor, &c., to couches and invalid chairs is then explained, and the specification, which is drawn up in a very lachrymose style, ends with an enumeration of the several maladies in which this improved bed, &c., would be found useful. As this is a question of degree rather than of kind, however, this list might have been more briefly, at the same time more comprehensively described as "all the ills that flesh is heir to."—Enrolment Office, July 21, 1840.

William Mattershaw Forman, of Sheepshead, Leicester, frame-smith, for certain improvements in stocking frames and machinery used in frame-work knitting.

This specification is of a very intricate character, and is only rendered intelligible by numerous complicated drawings. The invention claimed, however, is briefly the substitution of "catchers and fallers" for the old "jack"—a new position for the "slur-cock" acting upon the said catchers—the substitution of "dividers" for the old "lead" in which the sinkers were held—and for the employment of "camms and levers" not heretofore used in stocking frames. By this invention, the several parts of the machine are said to be greatly simplified, more easily constructed and much more durable; while the work produced by the new machine is said to be greatly improved.—Enrolment Office, July 25, 1840.

PROBABLE DURATION OF RIVERS AND OTHER WATER COURSES.

Sir,—In the *Mechanics' Magazine* for July 18th, 1840, I published some geological observations respecting the probable origin of metals, and I then stated, that information might be derived from tracing the courses of large rivers from their sources to their terminations, to supply facts for reasoning upon the probable duration of such water courses. Several years ago I mentioned to that great geographer, Major Rennel, my remarks upon several rivers in England, arising out of my early habit of trout-fishing, and he was struck with my representation of the massive and angular rocks which bound the mountain rivers from whence the springs and torrents arise—the progressive wearing away of the angles of large stones, the rounding of the lesser and rolling stones, the water worn pebbles, gravel, and sandy crystals—and finally the earthy alluvium carried down to the mouths or estuaries of large rivers. These important evidences were considered by Major Rennel as general characteristics, of the acclivities and distances between the sources and the terminations of rivers, when combined with the elevations, inclined planes, and levels of the beds of rivers. The sources of rivers arising from chalk-hills, are exceptions, because of the soft material through which the currents run, which is the cause that they do not present squared notches, and water worn stones or gravel, as may be seen exemplified in the rivers Wandle and Cray, near London. The two great sources of the river Thames, meander through alluvial valleys, seldom bounded by rocky mountains, and both the Thame and the Isis at this day spring from alluvial beds; but it appears from the hills above their present sources, that the original streams were higher up, and that the level valleys have been gradually filled with soft materials, gradually brought down from the adjacent hills by rains, now forming morasses. The valley of Stones in Wiltshire shows a ravine, which at a remote stage seems to have been traversed by a large and rapid stream; proceeding downward toward Salisbury, the upper valley being now dry, and the stream now leading to Salisbury has become decreased in size, perhaps owing to the destruction of the forests which formerly covered the neighbouring hills. The attraction of clouds by high lands, and by woods being generally admitted, we may infer the diminution of our rivers. Where the sources are not near the summit of a rocky mountain, we are unable to trace their former origin—but conical peaks, such as Doveton Peak, near Penrith, and Roseberry Topping, in Yorkshire, produce no rivulets, although the latter has a well of spring-water at its summit, and Doveton Peak exhibits the continued ravages of rainy torrents on its sides, carrying down the vegetable earth, and loosening large masses of hard limestone on its precipitous declivities. One of the springs which feed the Lake Windermere, arises in a deep rocky ravine, half a mile above that town; its sides are massive angular rocks, and the perpendicular falls or cascades are swollen by rains and melting snow from the mountain summit; the rapid declivity of the bed of this stream does not appear to be altered by the waterfalls, since they are progressively advancing upward and forming higher beds. In the flat meadows above the head of Lake Windermere and in the valley leading to Grassmere, there are several islets of detached rock having perpendicular sides, and rising from 10 to 20 feet above the level of the meadows; these broken rocky islets resemble some of the rocks at Tunbridge Wells, and they seem the results of a sudden eruption of water from the lake above, which ceased after the bulk of the lake had rushed through, leaving only the present channel of a brook to convey the occasional excess of water proceeding from the superior reservoirs or lakes to pass into the Windermere.

These general statements tend to show the limited duration of our best known rivers, but more circumstantial and more accurate details may yet supply the elements for computing the probable extent of time occupied by those changes in the sources and beds of rivers in our Island, and thence lead to historical indications, for estimating the antiquity of its present contour.

I am, Sir,
Your obliged,
ANTHONY CARLISLE.

THE TRIAL OF STRENGTH BETWEEN THE ARCHIMEDES AND WILLIAM GUNSTON.

Sir,—I have perused M.'s description of

the trial of strength between the *Archimedes* and the *William Gunston*, steam-tug, recorded in your last number,—but, before believing what he has advanced, it will be necessary to be in possession of satisfactory answers to the following queries:—How has the *William Gunston* fallen off in power from 60, nay, I believe, at one time 80 horse power to 40? Are the boilers of the *Archimedes* square or circular? What pressure of steam can the boilers of these vessels respectively bear? What is the length of stroke and diameter of the cylinders of their respective engines? Until such data are supplied, no correct conclusion can be arrived at as to the fairness of the trial.

I am, Sir, &c.

H.

July 27, 1840.

NOTES AND NOTICES.

Rise and Fall of the Barometer.—At a recent meeting of the Royal Irish Academy, the Archbishop of Dublin observed, that the sudden changes of the barometer were well known to be connected with the corresponding changes of the weather as to rain or drought, and the great and rapid falls with the sudden approach of a gale of wind; but it did not seem to be so generally remarked, that the *slow* and *continuous* changes of the height of the mercury in the barometer were likewise indications of the approach of a season of *long-continued* wet or dryness. It was to some connexions of this latter kind, noticed by himself, that he now drew the attention of the Academy. The first of these occurred in the early part of the summer of 1818, when, from the slow and gradual rise of the barometer for the space of ten days, he was led to predict the approach of a long-continued dry season. The drought which followed was one of the most remarkable that had occurred in this climate for many years. The second instance of the same kind observed by his Grace was in the early part of the spring of the present year. On the 17th of February the barometer commenced to rise, but very slowly, and the rise continued for six or seven days; he was thus led to expect a long continuance of dry weather; and the result, as is well known, fully verified the anticipation, the change being followed by more than three weeks during which there was not a single drop of rain, and that too at a season of the year usually wet.

Oram's Patent Steam Fuel.—It appears, from a trial made within the last fortnight, by the Pacific Steam Navigation Company's ship *Chile*, during her run to Falmouth, that the result was 28 per cent. in favour of Oram's fuel over Welsh (raw) coal, 800 lbs. less fuel being consumed in two hours work, running equal distances, with the same number of revolutions per minute, one main feature being, that the stowage of the patent fuel occupies one-third less space than that of raw coal. The fuel has been subjected to several tests, which have been highly satisfactory, and will, doubtless, have a considerable influence on steam navigation, more especially for long voyages, where the bulk forms so important a consideration. It is said to be easy to work, producing but little smoke, and few ashes.—*Times.*

Fouling of Copper Sheathing.—It is only about four years since the Admiralty steam-vessel the *Blazer*, was built, and her service has been principally in the Mediterranean Sea. On her return to be paid off at the end of last month, she was taken into one of the dry docks in Woolwich Dockyard, and on being examined was found to have her copper sheathing completely incrusted with barnacles, gordian-knotted corals, oysters, muscles, and various other shell fish, thousands of them alive, and in many places in clusters several inches thick. This state of the sheathing must have taken place from some chymical action on the copper which has not yet been accounted for. Perhaps a small portion of zinc may have been inadvertently used in its formation, or in the construction of the nails with which it had been fastened. It is not generally known that a very small portion of zinc, either by mixture, or by coming in contact with copper, will completely neutralise its quality of preventing the adherence of shell-fish in sea water. Mr. Marsh, a chymist connected with the Royal Arsenal, some time ago prepared two sheets of copper, eight feet long by two feet broad each, and had them made perfectly smooth and polished with cork and sand. He then placed them in troughs made for the purpose, the one in its pure state, and to the other he attached a small piece of zinc, about four inches square. The troughs were afterwards filled with sea water, taken in barrels from the Nore. In the course of 24 hours the pure copper acquired a deep green tint like verdigris, losing all its brightness. The other piece remained in the water about four months without the slightest visible change, or losing any of its original polish. From this fact it is probable that the green colour acquired by the pure copper was of a poisonous nature, and of a substance which renders that metal so valuable when applied for sheathing to vessels. The boring worm has committed depredations in the timbers of the *Blazer*, several holes being found, some of them nearly through pieces eight inches thick; but this has been accounted for by the discovery that a portion of the copper sheathing had been torn away by grazing on a rock.—*Times.*

Sir James Anderson's Steam Carriages.—From a communication addressed to the *Sunday Times*, by Mr. J. W. Rogers, the partner of Sir James Anderson, we learn that "several steam drags are being built at Manchester and Dublin, under Sir James's patent, and one has been completed at each place. At Manchester the drag has been frequently running between Cross-street and Altringham, and the last run, made some days since, in the presence of Mr. Sharp, of Manchester, Mr. Dixon, civil engineer, and several other gentlemen, was accomplished at a speed exceeding 20 miles an hour, with a load on the tender of about four tons. The performances of the Dublin carriage, are said to be equally satisfactory. On the 25th instant, this carriage was out for an experimental trip, and ran from Nottingham-street along the Howth-road to Killester, returning by the Green Lanes, Clontarf Castle, and home along the shore. A passenger-carriage was attached with the workmen, and countrymen taken up on the road; there were twenty-one persons on it. The average speed was about 14 miles: but at times it was equal to 20 miles an hour."

Voltaic Typography.—Herr G. A. Muller, mechanician of Leipsic, has recently called attention to the application of the Voltaic mode of copying to typography. He has, however, been in some measure anticipated by the experiments made in 1839 at Rosel's printing office in Munich, where, by following the method of Jacobi and Spencer, the lines of copper plate were produced in relief. Woodcuts were also converted into metallic plates, which, to say nothing of the advantage of the solidity of the metal, far exceeded the effect of the most perfect casting. The experiments for making stereotype plates in copper have also been successful. In short, the invention has now reached that stage which must secure for it the attention of all practical men.—*Munich Paper.*

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CUBITT'S PATENT ROOF.

Fig. 2.

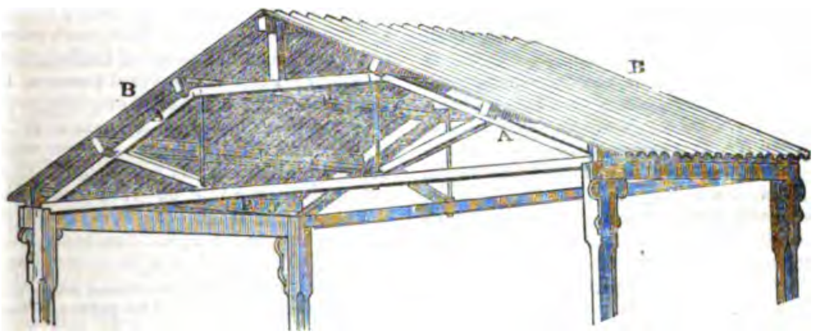


Fig. 1.

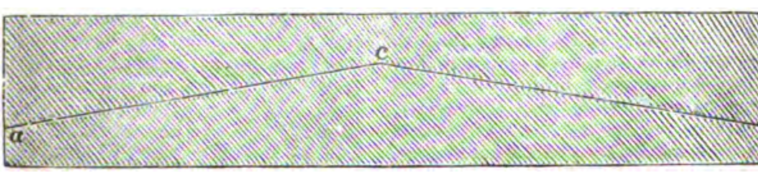
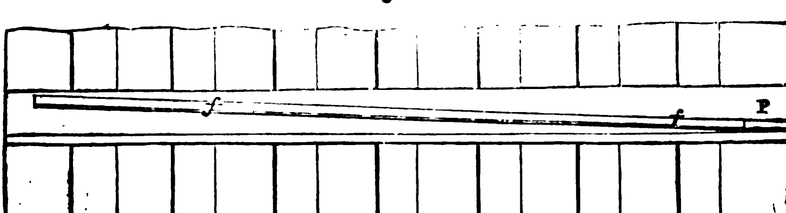


Fig. 3.

Fig. 4.



CUBITT'S PATENT ROOF.

[Patent dated January 30; Specification enrolled July 30, 1840.]

The "improvements in roofing," patented by Mr. Cubitt (the eminent builder of Grays Inn Lane,) are of a very ingenious character, and though confessedly not adapted to first-rate or other houses requiring roofing of a permanent and perfectly weather-tight description, will be found, nevertheless, of very extensive application. Wherever quickness of construction, lightness, and cheapness, are objects of importance, and no more is cared for, than protection over head during ordinary states of the weather—as in the case of colonnades, virandas, pent-houses, drying-houses, tool-houses, boat-houses, workmen's sheds, railway stations, &c. &c.—these improvements will be found of great applicability and value. Even for dwelling houses in fine climates, or such hastily put-together habitations in the woods, as most colonizing emigrants must be content with for a time, Mr. Cubitt's new description of roofing, will by no means be unfitted. As good as a roofing of slate or tile, or iron, or lead or zinc, it certainly is not, nor is it offered as such; but wherever wood is the material made use of, Mr. Cubitt has shown how it may be adapted to the purpose more quickly, more neatly, more effectually, and more economically than has ever before been done. Mr. Cubitt makes his roofing of common boarding and of one thickness only, except at the joints or overlapping parts; but the boards are fastened, and put together after so peculiar a manner (without either caulking or pitching,) as to be impervious to all but long-continued or tempest-driven rains, and when wet does soak, or trickle through, there are contrivances provided underneath for carrying it off at different salient points, and thus preventing any inconvenience or injury to the persons or things sought to be protected. The only rafters required are two principal sets, one at each end; all the secondary rafters commonly used in roofing being dispensed with, and the boards resting throughout the greater part of their lengths on purlins merely. The following details of construction we extract from Mr. Cubitt's specification; the illustrative figures referred to, will be found on our front page.

"I take," says Mr. C. "a board of any width and thickness, but the dimensions which I prefer are a width of 3 and a ½ inches, and a thickness of one and a half inch, and I cut this board into two pieces in such a manner that the face of the one is ridged, and that of the other channelled or furrowed. Supposing the board to be of the above dimensions, as represented in fig. 1, which is a transverse section, I adjust a circular saw to cut three and a half inches, so that on the board being applied to it edgewise, it shall reach only to its centre; and instead of holding the board to the saw in a vertical position, I keep it inclined a little to one side, say 2 or 3 degrees less than an angle of 90°. Under these circumstances the saw will make a regular cut half way through the board, as from *a* to *c*, fig. 1. I then shift the board and present the opposite edge of it to the saw, keeping the board inclined as before, when a corresponding cut on the opposite edge from *b* to *c* separates the board into two parts; both pieces being flat on the under side, but the one being ridged on the face, the other channelled. A number of boards being thus prepared, and of a length suited to the building to be covered, the roof is formed in the manner represented in the perspective elevation, fig. 2, that is to say, the common rafters are dispensed with, and the principal rafters (A A) only made use of, tied and stayed as usual, upon which are placed the purlins P P, to which the boards B B, are nailed—a ridged and channelled board being laid alternately, so that each ridged board shall overlap two channelled ones, as shown in fig. 3. The surface of a roof thus formed will be found so well adapted for carrying off the rain-water, that a very slight degree of overlapping will in general make it sufficiently close and tight for all ordinary states of the weather. But as a little water may find its way through, after a long-continued rain, or the prevalence of driving winds, I let into the under sides of the purlins, fillets of wood *f f*, for the reception of such water, which fillets have a fall towards one end, where they drain into similar fillets attached to the principal rafters, by which the water is carried off. A separate view of a purlin fitted with one of these fillets, is shown in fig. 4."

Mr. C. adds, "Cases may occur, where the price of wood is so high as to make economy of material of more importance than neatness and completeness of finish; in such cases a number of boards may be cut in the manner before described, out of the log, but in such cases the two outer boards only will be flat on the under side, and all the others will be ridged on the one side and channelled on the other, and may be used either side uppermost, provided always that the alternate order before directed is observed."

REQUIREMENTS OF STEAM LOCOMOTION ON TURNPIKE ROADS.

Sir,—If we are looking for steam coaches to convey passengers, merchandise, &c. in regular trips on common roads, starting at a determined hour from one town, to arrive after a reasonable time at another; then, Mr. Editor, what occasion is there for the wonder which is so continually expressed whenever a steam-carriage *has ascended a hill*, or traversed a *newly gravelled road?*

We can readily conceive, how in 1825 such an occurrence, being then, as new in fact, as it was controverted in theory, was a matter of considerable surprise. But now Gurney, Heaton, Ogle and others, have by their exertions produced so many instances of success, that every man of moderate information is satisfied of the practicability of steam-coaches being made to ascend hills, traverse gravelly roads, and perform every required evolution of the best stage coaches. The question now seems to be—in what state is the machinery of a steam-coach after *some* hills have been rapidly ascended, or gravel roads quickly traversed? Or, in more distinct terms, how many hills, or how many miles of bad road, will a steam-coach now run over without such derangement of its machinery as will impede its further progress?

Under this view, I wrote the letter inserted in your number 884, which is alluded to, but not answered by Mr. Hill, and Colonel Macerone in your 886th number; both merely stating that they have ascended hills in their trips, and Col. Macerone that he has again run with great ease on a piece of gravel road, of the truth of which I have no doubt.

But what is the fact relative to the state of the machinery after a run of some extent, like the last trip of Mr. Hancock from London to Cambridge—certainly the most brilliant achievement of any steam-coach, especially when we consider the size of the coach performing it? The trips of Mr. Hill from London to Brighton, Tunbridge Wells, &c., are also remarkable, but these minor performances of short trips, when starting at long intervals, are not entitled to any serious consideration, as indicating the present actual state of locomotion on common roads. Mr. Hancock perfectly well understood this state of the question, and he accordingly published a candid and minute description of the state of his machinery in the progress of his long trip, in your number 843. Mr. Hill's trips, as far as I know, are only recorded in two brief articles in the *Globe*, which conclude by expressing an apprehension that steam-coaches will not succeed in hilly countries. Mr. Hill, in his letter to you, Sir, assures us that he ran up hills at a quick speed, his engine being uninjured. The *Globe* must consequently have been wrong in its apprehensions.

But if the steam-coaches of Mr. Hill and Col. Macerone are running up hills without any derangement of their machinery, (and I raise no doubt) what may be the reason that we do not hear of a line of steam coaches by these gentlemen, engaging to run from London to any town in the country for hire, and starting at regular hours from a given point?

The whole of Europe, is waiting impatiently for the running of such a line of steam-coaches on common roads, performing well for weeks, months, and years. Millions of pounds sterling would be invested every where in this mode of conveyance as soon as such men as Mr. Hill and Colonel Macerone should have convinced the public that the engines performed well, without continual and expensive repairs, *and the coaches were seen* RUNNING *regularly every day*.

Perhaps, Mr. Editor, it may be said in answer to me, that these coaches being private property, are not to start at public will; and that the public must wait for their desired regular lines of actively running steam-coaches, till somebody else is willing to reap the immense benefit, which undoubtedly awaits the successful establishment of a line of steam coaches on any public road.

I, for one, am ready to submit to so unquestionably good and logical an answer to my question, which places Mr. Hancock's account of his trip, and Mr. Hill's and Colonel Macerone's letters in a most comprehensive light to any inquirer after facts: and I doubt not that the public at large will now see as clearly in this affair, as you and I, Sir, do.

But as notwithstanding all our clear perception of the case, it appears possible, that steam coaches, in which the whole power of the engine is occasionally exerted, may be liable to derangement in their mechanism, it will remain for the persons who will in future make the running of steam-coaches a profitable speculation, to see if enlightened by the circumstantial evidence of so expert a man as Mr. Hancock in his trip to Cambridge, they will not try their utmost, to have engines as perfect as possible—able to withstand the quickest ascending run of *scores of hills* or the *traversing miles of bad roads of any description*—without experiencing such derangements in their engines, as will diminish speed, or stop the coach for any time; but on the contrary, stand a journey of reasonable length—so, that the public *will travel with them as a matter of business*, and not simply take an experimental trip for pleasure.

Much power is required to perform this great desideratum; but on the other hand, the inevitable consequences of collision on common roads, must be prevented, in every detail, and reduced as much as possible. The effect of a pressure of nearly of 15 to 20 atmospheres in the working parts of the engine, when the full power is exerted, ought also to be counteracted in some manner, without any diminution of the working power.

The object of my letter in your number 884, was not to insist upon the excellence of my own conceived remedy, although I certainly believe it to be a good one; but to present the general principle to the attention of your readers, for their own advantage, and to obtain at last *some line of steam coaches on common roads.*

The public sympathy will certainly be highly raised in favour of such steam-coaches on common roads, *as will, and can run at any time required.* The benefit of having a competition against the monopoly of railroads, will be readily admitted by passengers in general; the complaints uttered against that monopoly in the House of Lords a couple of nights since are pretty generally experienced in all countries where railroads exist now exclusively. But besides that, throughout Europe there are many thousand miles of good roads wanting quick and good steam-coaches, that will sustain the interest of inns, and trade in general, and benefit the public, and ultimately even the railways themselves.

I hope you will insert this letter, and believe me to be,

Sir, you most humble servant,

A. GORDON.

4, Jewin Crescent, August 6, 1840.

MACHINE ENGRAVING.

Sir,—In No. 886 of your very useful publication I observe a notice, that a Mr. A. E. Walker has taken out a *patent* for "*Improvements in Engraving by Machinery.*" It seems, he cuts each separate object on a steel *die*, hardens it, transfers the impression to another soft steel die, hardens *that*, places it upon his copper-plate, and by *hammering*, forces the raised design into the surface. This arrangement has been so long practised that Mr. Walker must be the only man in civilized society, who is unacquainted with the fact.

Messrs. Perkins and Bacon of Fleet Street, had a patent—which I fancy has expired—for the same thing, but their method of carrying it into effect was much more scientific and certain. The vignette on all the notes of the Bank of England and Ireland is indented in a similar way. It is first engraved on a soft steel *roller*, then hardened, transferred to another soft steel roller, and this when hardened is placed upon their *steel* plates, and gradually worked into the surface, *by the regular and steady pressure of a steam-engine*, which is performing various other operations at the same moment in different parts of the edifice, such as turning the printing presses, registering each workman's notes separately as he finishes them, and many other curious and useful purposes.

The *roller* and the *engine* are assuredly superior to Mr. Walker's convex *die* and *hammer*, but by patenting retrogressions

in science it indicates a change of taste, at all events.

I have often proposed a new mode of chalk engraving which I think would be found a great improvement, and it might be performed by any one, not an engraver, well acquainted with the rules of drawing. The ordinary effect is now produced by making small perforations on the plate with the *triangular* point of the graver. These dots are consequently never *round*, as may be seen by the glass.

Now, if a variety of sizes of round polished pointed *punches* were used instead, each dot would be perfectly *circular*, and might at once be made large or small, deep or shallow, as the shading required. This would be more in accordance with the pores of the skin, would effect a softer and more perfect light and shade, and be accomplished with thrice the usual facility.

W. A. K.

MAPPLEBECK AND LOWE'S NEW SNUFFER TRAY.

(Registered pursuant to Act of Parliament.)

One peculiar characteristic of the present age, is the happy adaptation of "means" to the "end"—of "things" to the "offices" they have to perform; and perhaps it would be difficult to find a more apposite illustration of this remark than the little article represented in the prefixed engraving. *Snuffers*, it is well known, have been tortured into a great variety of forms, and constructed upon a great variety of principles, patented and unpatented; the "*tray*," however, notwithstanding its palpable inadaptation to the form of any sort of snuffers ever yet invented, has, till lately, remained altogether unmolested in its original unfitness and ugliness (if we may except numerous attempts at adornment, some of which have displayed considerable taste). The best of the tray-class seem as if they had prided themselves in being as little conformable as possible to the parties for whose convenience they were made. All snuffers are, and must be, of a triangular shape; but, strange to say, all snuffer-trays or holders have hitherto been of *every other shape* (almost) saving and excepting the triangular alone!

The improved snuffer-tray shown in the prefixed engraving, is the production of Messrs. Mapplebeck and Lowe, of Birmingham, and, for the reason just stated, is not only quite unique, but extremely elegant. One end is shaped so as to afford room for the point of the snuffers only, and the other so that the bows shall occupy the whole width. The superiority of this form over the round-ended and parallel-sided trays of former times, must be at once admitted. Not only is the sense of fitness, which by some is regarded as the only certain criterion of beauty, thus gratified to the full; but there is this material advantage gained in point of wear, that there is no shifting nor scratching.

The snuffers honoured by a connection with so suitable and elegant a depository, are "Greenway's Patent," of which Messrs. Mapplebeck and Lowe are the manufacturers. The most striking peculiarity of these snuffers, is a receptacle for the snuff placed beneath the box where it is usually held; by which means the cutting part of the snuffers is kept constantly clean, and the snuff is secured from falling about while the snuffers are in use. The action of the rising and falling plate in front, is also exceedingly well managed, motion being given both in the opening and closing directions by

two inclined planes, without the intervention of springs of any kind. For efficiency and durability, as well as for their pleasant action, these snuffers seem likely to secure a very large share of public favour. As regards the "tray," its relationship to the whole family of snuffers, seems now, for the first time, to be satisfactorily established.

PADDLE-WHEELS AND SCREW PROPELLERS.

Sir,—The experiments mentioned at page 149 of your last month's number, on the screw and paddle-wheel propellers, are well deserving of notice, inasmuch as they prove satisfactorily that the screw propeller has a valuable property very necessary in swift sailing vessels, which the paddle-wheel has not, and I am disposed to think that these experiments, so far from proving any superiority in the paddle-wheel, prove the reverse. The average speed of the *Archimedes* is, I believe, about eight or nine knots an hour, and it appears from the foregoing experiments that she could draw the tug-boat, when her paddles were at rest, with ease. Now, from the construction of these tug-boats, with wheels of small diameter in proportion to their breadth, they are not well adapted for quick sailing; as it is well known the more powerful these vessels are made as tug-boats, the slower and worse will be their sailing capabilities; probably the tug-boat in question would not exceed ten knots an hour, if it would come up to that speed; at any rate it could not travel faster than the speed of its wheels—not so the *Archimedes*. What I contend for is this, that the tractive power of the tug, from the state of rest until she acquires her greatest velocity, diminishes with her in a much greater proportion than the tractive or propelling power of the screw, and that if the latter has not at starting as great a power as the former, she nevertheless retains and keeps up a more uniform power up to her greatest speed, and for quick sailing vessels it is unnecessary to add that it is there this power is required at starting; in comparison with the other vessel she has little propelling power, and still less when drawn backwards, yet the speed of the *Archimedes* proves that when at considerable speed her power is not much diminished; if her power was reduced in the same proportion as that of paddle-wheels, she would not move two knots an hour: moreover, she is the first experiment made with the screw it may be said, whereas the other vessel is fitted up with the latest improvements; in short, there is this difference between the screw and the paddle, that the former is analagous to the power of the wind when it is said to be on the beam of the vessel, and sails properly set, for it is known that wind moving with a velocity of 20 miles an hour has given a velocity of 25 miles an hour to the Indian prow, when if the wind was fair in the direction of the vessel's sailing, it could not possibly have come up to 20 miles.

The proper mode of ascertaining accurately the comparative power of these vessels as tow boats, would be to get both the vessels side by side to assist each other in drawing a third vessel by means of a cross bar attached to the tow-rope, and by shifting the rope on the bar, the leverage will show which has the advantage.

To assist in forming any idea of the powers of these two boats they should have tried their speed in a race, and they should have also tried their speed, each drawing the other, the drawing boat only having the engine in action. These particulars would very much assist in forming a correct judgment of their respective merits.

I remain, Sir, your obedient servant,

M.

NEW APPLICATIONS OF TANNER'S BARK.

Sir,—For centuries this article has been thrown away as entirely useless, but it is now applied to various useful purposes; the principal of which is the use made of it by the white lead makers, instead of dung, for decomposing the raw lead; it is likewise used in large quantities for heating bakers' ovens, as well as pressed into flat cakes, and used in lieu of turf for keeping in fires. To the agriculturist, it has hitherto proved unserviceable, but a friend of mine in the neighbourhood of Newcastle-upon-Tyne, informs me he has applied it with some success to potatoe grounds. Thus my favorite adage is here strengthened, "that every thing may be rendered useful,"—even spent tanner's bark.

ENORT SMITH.

SUBMARINE ILLUMINATION.

"When lo! a burst of thunder shook the flood,
Slow rose a form in majesty of mud."—
Pope—The Dunciad.

My Dear Sir,—One of the solemn games of the dunces in Pope's admirable satire, was diving into the mud;—the deeper the diving the higher the glory!

In consequence of having meditated, and written so much as I have done, on diving operations in water saturated with black mud and midnight darkness, I cherish fervid aspirations that when these classic games shall next be solemnized, on a re-opening of that venerable murky excavation, Fleet Ditch, in London, I shall be found qualified to be a competitor and formidable rival of every other champion,—that I shall have a murky coronal placed upon my jobbernole by "the mud nymphs" named in the poem, in their darksome grottos, and that I shall emerge from the dead-dog-impregnated fluid,

"——— a form in majesty of mud."

In one of my letters published last autumn in your pages, I quoted as a heading, the following passage from "the Lay of the Last Minstrel":—

"From the roar of Teviot's tide,
Chafing with the mountain's side,
From the groan of the wind-swung oak,
From the sullen echo of the rock,
The Ladye knew it well;—
It was the Spirit of the Flood that spoke,
And it spoke to the Spirit, &c."

My letter to you concluded by a description of the means by which I make improvements in the theory of diving operations, viz. "by conflict, in meditation, between my spirit and the spirit of the flood!"

Now, my dear friend, I am quite sure that you shuddered, and were covered with cold sweat, when you read these words in my M S., perceiving how "*triste y hororoso*" must be the nature of this conflict to me;—recollecting, as you did no doubt, the multitudinous numbers of those human beings, men, women, and children, who since the creation of the world have been drowned; and who have been therefore, poor water-rat mortals! during all that long series of ages, manuring, and fertilising, and fattening, and giving *increase of vitality* to the Spirit of the Flood, my metaphysical antagonist, by the infusion into it of their lives!

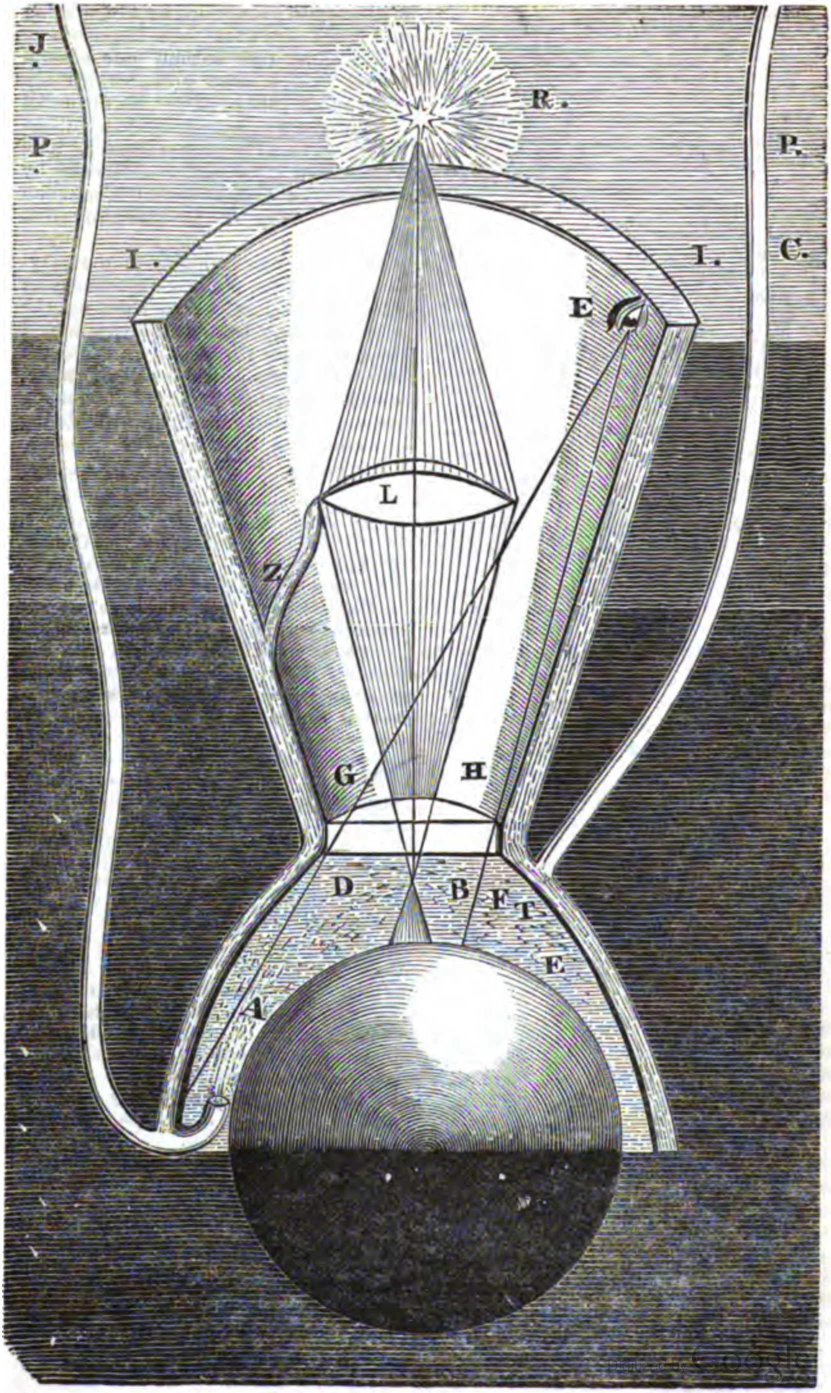
Therefore, take solemn note of the terrific disadvantage under which my spirit comes into conflict with the awful spirit of the flood—more especially when you remember the intense (but yet how amiable and interesting!) diffidence by which as an Irish protestant O'Connellite agitator, I am so pre-eminently distinguished!

However, now laying aside the playfulness in unison with my quotation from *The Dunciad;* before entering on the subject of my own communication, I shall with your permission give from the Rev. Mr. Kirby's Bridgewater Treatise, an exquisitely beautiful and interesting fact in nature, connected with diving operations:—

"*The Water Spider.—Argyroneta aquatica.* ——————— the Water Spider is one of the most remarkable upon whom that office is developed by her Creator. To this end, her instinct instructs her to fabricate a kind of *diving-bell* in the bosom of that element. She usually selects still waters for this purpose. Her house is an oval cocoon, filled with air, and lined with silk, from which threads issue in every direction, and are fastened to the surrounding plants; in this cocoon, which is open below, she watches for her prey, and even appears to pass the winter, when she closes the opening. It is most commonly, yet not always, entirely under water; but its inhabitant has filled it with air for her respiration, which enables her to live in it. She conveys the air to it in the following manner: she usually swims upon her back, when her abdomen is enveloped in a bubble of air, and appears like a globe of quicksilver; with this she enters her cocoon, and displacing an equal mass of water, again ascends for a second lading, till she has sufficiently filled her house with it, so as to expel all the water.

"The males construct similar habitations by the same manœuvres. How these little animals can envelope their abdomen with an air-bubble, and retain it till they enter their cells, is still one of Nature's mysteries that have not been explained.

"We, however, cannot help admiring, and adoring, the wisdom, power, and goodness manifested in this singular provision, enabling an animal that breathes the atmospheric air, to fill her house with it under water, and which has instructed her in a secret art, by which she can clothe part of her body with air as a garment, and which she can put off when it answers her purpose.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"This is a kind of attraction and repulsion which mocks all our inquiries."

This fact in nature is exceedingly curious and beautiful, and I am quite sure that such of your readers as may deem this letter worthy of a perusal, will be greatly obliged to me—those who were already acquainted with it, for recalling it to their attention, and those to whom it may be quite new, will be still more obliged to me for an extract flashing on their minds a fact so astonishing, and so delightful!

Thus it appears, that by some to us, utterly occult energy of its animal organization, the successive descents of the little water-spider under the impulsion of its instinct, produce effects in its subaqueous pavilion equivalent to those produced in the diving bell, or diving helmet, by the successive strokes of the condensing air-pump of scientific man!

In the language of the book of Psalms, this insect "layeth the beams of" her "chambers in the waters," and there secures her subaqueous chambers in the manner already described.

And now, I pray permission to proceed to a description of the sectional diagram which I send you—adopting the name which you yourself so kindly recommended, I have called it most felicitously "*The Submarine Occular Penetrator.*"

I alluded to the effect capable of being produced by the application of the principle of construction several months ago, in a letter to the Editor of the *Morning Chronicle*, on the subject of the operations on the *Royal George*—operations carried on in dreary darkness—the divers working like the blind, by touch entirely, but without vision.

I have had many conversations on this subject with those admirable divers, the Messrs. Deane and Mr. Peter Tall, in London, Clare, Limerick, Liverpool, and Portsmouth, and they are all eager for illumination under water.

It would be impossible for me not to entertain the highest respect for Colonel Pasley's private character,—for his military, and his scientific character; but I am compelled at the same time to record in your pages, my decisive dissent from a doctrine propounded by that amiable, brave, and learned soldier, in a letter of his which I read in the newspapers.

He distinctly admits the existence of the darkness, but at the same time declares his opinion, that unless the whole wreck could be viewed together, any illumination of the parts in succession would be quite useless.

Is a torch or a lantern useless in a London midnight fog, although it only illumine a portion, and a very minute portion of London, as the holder of it walks along—although it do not shed a gorgeous effluence over the whole metropolis?

I am in science as well as politics, a quiet, easy-going, protestant O'Connellite destructive, accepting all instalments, but never abandoning my claim to the full measure of submarine irradiation, or of justice.

Now I am direfully afraid that Colonel Pasley is a chartist impracticable in submarine science; who, unless he can have the whole ocean together as bright as a tropic noontide, will have utter darkness.

Universal suffrage or nothing! no *successive* extension! howl the chartists (I mean the impracticable ones, for I am a chartist myself). Universal illumination in the waters of the deep, says Col. Pasley, or no light at all!!

As a quiet, steady-going, O'Connellite protestant destructive I solemnly protest against chartism in diving in muddy water.

As an aspirant to the championship in the solemn classic games described by Pope, I protest against this doctrine.

The gallant Colonel avows that he likes to perform his operations under a blanket—the blanket patronized by a very distinguished lady, "the blanket of the dark," alluded to by Lady Macbeth in Shakespeare's tragedy.

A friend who has an exquisite perception of quiet humour, sent me some time ago, from London, the following quotation from an ancient Greek comic writer, and a translation, which I subjoin.

The extract applies most felicitously to the subject on which I have not the good fortune to coincide in the opinion of Colonel Pasley.

Ο πρωτος ευρων μετα λυχνούκου περιπατειν
Τὴς νυχτος ην τις χηδεμων των δαχτύλων·

Of which the literal version is this:—

"The person who first invented walking at night with a lamp, was a great care-taker of his fingers."

Colonel Pasley would perhaps, in derision, say the same of the first who under darksome water used his eyes and a light, instead of groping with his fingers, lest he should wear them out.

My friend's translation of this fragment of good humoured playful irony, is the following:—

"He, for his fingers had a wond'rous care,
And their tips would save from wear and tear,
Who first a lighted lamp did bear,
When the night's pitchy darkness fill'd the air."

And now for a description of the sectional diagram which accompanies this letter.

In order not to make this article too long, I am obliged to assume that the reader is acquainted with the principle of construction of "The Submarine Focal Illuminator," of the power of which instrument the "Occular Penetrator," is an extension.

To this extension I have long since alluded in my notice of experiments made by me in Paris and London, and at the bottom of Kingstown harbour, near Dublin, on the night of the 31st of last December.

Imagine R to be a radiant; I I a section of a part of a hollow instrument, for example, of the focal illuminator; let L be a sectional view of a double convex lens; G H, a sectional view of the clear and strong glass delineated in the wood cut of the focal illuminator.

This glass is to be of pellucid clearness, and to be set perfectly air-tight; for it is not merely a part of an optical instrument, but it is also a part of the diving apparatus.

Let A D B F T E represent a section of a circular vessel of which the glass G is a portion, this vessel to be in identification with I I, as a part of the instrument. Let C P be a condensing air-pipe, inserted into the last mentioned portion, and let J P be a water pipe retorted for the purpose of forcing a *jet* of pure water upwards or obliquely as may be necessary according to circumstances.

Let the solid figure partly seen within the vessel and submerged in muddy water, or in water impregnated with lampblack,* or mercury, or thick opaque cream, or even in *black soft mud*, be a sphere (as in my drawing) or a cube, cone, &c., or any other regular or any irregular figure.

Let E be the eye of the person applying the principle of the instrument.

Let Z be a piece of metal attaching the lens to the inside of the instrument in the manner represented in the drawing.

It is manifest that (within certain limits of obliquity) an instrument of this construction could be used as, if I may so call it, a diving bell for the eye (A D B F T E) and by its means things would be rendered visible in opaque fluids which would otherwise be as occult as if inclosed in rocks of the most solid Egyptian porphyry.

By placing it as in the drawing, the muddy water, or water saturated with lamp black, described by Mr. Deane in his book, (of which I presented a copy from him to the Institution of Civil Engineers) or in mercury, or in cream, or *in soft mud*; and by working the condensing air-pump, the fluid, whatever it be, might be removed from the eye's diving bell; and then, secondly, by forcing a jet of water to play within it, it would remove any deposit from the glass and surface of the object, and the object would be washed—would be irradiated—and would become visible to the eye at E of the person using the instrument.

You have, I observe, published a notice taken from the Irish and London newspapers, of my forthcoming essay on the improvement of the navigation of the Liffey; but I have in contemplation another work of far greater general importance than this, or even my essay on the navigation of the Shannon—the most magnificent river in the British Islands.

The ghost in Hamlet tells us of Lethe's *Wharf*. Now, recollecting the stupendous trade carrying on on the waters of that river, viz. the export trade to the islands in the great dead sea of oblivion; and being myself an industrious manufacturer of literary merchandize for that market, I shall publish a folio on the means of improving the navigation of the river Lethe, to such an extent as, in some degree, to render it fit for the London and Liverpool-like trade carried on on its "dull oblivious flood."

I remain, my Dear Sir,
Your ever true and faithful friend
THOMAS STEELE.

Eagles' Crags, O'Connell Mountains,
County Clare, July, 1840.

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* See Mr. Deane's Submarine Researches.

PATON'S FLOWERS OF PENMANSHIP.*

Chaligraphy, or penmanship, is not commonly ranked among the Fine Arts, though why it should not, it might be difficult to show. We cannot go so far as to say with the able (or to speak more truly, perhaps, inimit-able) chaligraphist, the triumphs of whose hand are emblazoned in the work before us, that the same qualities which go to the making of a great man in any other department of human exertion, are necessary to the production of a great penman; but, doubtless, Chaligraphy is an art, and a very fine art—requiring a good head as well as clever hand—great taste and great skill—felicity of conception as well as felicity of execution—not only a nice sense of individual beauty, but first-rate powers of grouping separate forms into harmonious and pleasing combinations. Engravers who do but copy the lines of others are eligible to the highest honours of Foreign Academies of the Fine Arts, and even in our own ill-constituted Academy they are admitted to an under-the-salt seat as "Associates;" but chaligraphists, whose handwork is all their own—who furnish copy lines to all the world—have no place in any of these institutions! How this is to be justified we feel curious to know. We can perfectly understand how a chaligraphist, who has achieved fame and fortune for himself, without academic aid—as Mr. Paton has done—may very heartily despise—as Mr. Paton seems to do—all such marks of distinction as Academies have it in their power to confer; but we cannot help thinking that it deeply concerns the lasting prosperity of the art of which Mr. Paton is Grand Master, and ought therefore to be Grand Protector, that its claims to equal consideration (at least) with other arts more highly honoured should not be so unfairly slighted. Mr. Paton expatiates in his "Preface," with much self-complacency on the happiness there is in the consciousness of being of "the few and far between" order of Penmen—a "Genius"—a "distinguished character"—a "*Great* Man"—not only so in reality, but (happy fate!) "regarded by the world as such;" he refers to the chink of the "substantial encouragement" in his pockets for an incontestible proof, that even in this life, such "genius and perseverance" as his (in the chaligraphic way) do not go unrewarded, and with that fond longing after immortality common to all men of true genius, he concludes with a confident hope that "when he dies, his name will be handed down as a talisman to all who follow in the same course!" All this may be very well for Mr. Paton, who by rare luck has had his great merits (his extreme modesty, perhaps excepted) as universally acknowledged as well rewarded; but he forgets how many deserving practitioners of the same art there are ("poorer brethren") who have experienced no such happy chances in life—to whom a recognition of the chaligraphist's just title to the distinction of "Artist," with the prospect some day of rejoicing in the addition of "R.A.," would not only be a great spur to exertion, but a vast help to successful practice, and under the worst of disappointments, a fertile source of consolation. Easy it is to hint to aspiring imitators, to "follow in the same course;" but this is just as if a man who had drawn a 40,000*l.* prize in the lottery, were to exhort others to "go and do likewise."

Mr. Paton's celebrity as a Penman can hardly be promoted by any praise of ours; and, to confess the truth, we feel no great desire to laud one who lauds himself so highly; yet it would be unjust to withhold the expression of our honest opinion, that great as that celebrity is, there is ample evidence in the publication before us of its having been earned by surpassing merit alone. We can imagine nothing more beautiful in the chaligraphic art than most of his specimens. If we might venture to offer a suggestion for amendment, it would amount to this, merely—that the author would adhere more uniformly to *nature* in his penmanship (it is but of a *very few* exceptions, such as his Dedication to the Royal Academy, we would complain). The application of the term *nature* to such an art as this may startle some people—your hanging-wood and waterfall enthusiasts, for instance—but most true it is, nevertheless, that nature has much to do with this as well as with every other art of man. To confine ourselves to the case in hand—*thick* strokes where no such strokes *could* be made by any use that could be made of the pen working from right to left (the manner of all right-handed people) is decidedly *unnatural*, and ought therefore to be carefully avoided. Mr. Paton affirms in his Preface that it is "impossible" to lay down any rule whatever with respect to "flourishes;" but we submit this to be one rule no less incontestable than useful—*never pretend to do that with the pen, which the brush only can accomplish.*

* Fourteen folio plates. London, 1840.

MR. HALL'S SYSTEM OF CONDENSATION.

Sir,—You may perhaps remember that at the commencement of this discussion I troubled you with a few observations in reply to "Scalpel," which I afterwards withdrew on the appearance of his second paper (No.

882), which rendered them in a great measure useless. Of the merits of that paper I need not dilate as I have heard its excellence so universally admitted; there this discussion might have rested, but Mr. Hawke in your 884th number, and Mr. Oldham in your 886th, still insist upon the "real superiority of Mr. Hall's condensers over the common condensers." It is perhaps as important to myself as to any one that the fact, if so, or the reverse, should remain recorded in your pages; for the full discussion of the 30½ vacuum by "Scalpel" may prove of singular service to me, and I hope to thank him in your journal at some future time, and to ask his opinion on the result, albeit he watches so jealously over the fame of the great Watt.

Mr. Hawke observes, at p. 136, that he "agrees with 'Scalpel' that the barometer is not a conclusive test of the power exerted by the engine." But he proceeds, "it is conclusive so far as the action of the engine depends upon the vacuum in the condenser." He then observes to the effect, that the same good vacuum not being found in the cylinder, is the fault of the eduction valves not being large enough to allow the escape of the steam with sufficient rapidity to the condenser—not the fault of the slowness of condensation. He next makes this statement that "the barometer showing that the vacuum in the upper chamber does not differ more than one-eighth of an inch from the vacuum in the lower chamber *proves incontestibly that a considerable increase of power* is afforded to the engines of the British Queen by Mr. Hall's condensers," though just before he has admitted that "the barometer is not a conclusive test of the power of the engine!" "Scalpel" might well content himself with merely observing on this point "a little consideration, and Mr. Hawke will not agree with himself or Mr. Oldham," who follows in the wake of Mr. Hawke and admires this "beautiful and lucid" explanation! Now I merely ask Mr. Hawke and Mr. Oldham, why they have not said a word as to the *time* when this vacuum in the upper chamber is produced which "Scalpel" has so earnestly requested. It matters not how long the gauge may communicate with the upper chamber which Mr. Oldham lays so much stress upon, unless he states at what *particular* part of the stroke the 30⅝ vacuum is found in such upper chamber. Will he be good enough to do so?

I take for granted, indeed it follows as a matter of course, that, Mr. Hall would never risk the action of his condensers unless he gave the dimensions of the eduction valves. What then is the advantage of 30½ vacuum in the condensers when no *power* is obtained by it, if Mr. Hall cannot get a *corresponding* vacuum in the cylinder, where alone it would "prove incontestably a considerable increase of power?" And, particularly, I would ask where is and what is the *assumed* increase of power when the 15 *horses* for working the force pumps—and increase of weight are deducted?

As regards Mr. Oldham's diagrams they require more details, for they do not give sufficient data by which *accurately* to estimate the mean vacuum. Will he be so good to explain them, and to state the mean steam pressure? Also what was the *figure* of *the first* indication of the exhaustion (for it never could be 12 I think)? And the exact number of variations between the *first* and 12, and between 12 and the 16.5 as given? Also what part of the stroke the piston had made when 12 was indicated.

I am, Sir,

Yours respectfully,

V. I. E.

Gloucester Terrace, Tottenham,
August 3rd, 1840.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

John Ridgway, of Cauldron Place, in the County of Stafford, china manufacturer, for certain improvements in the moulds used in the manufacture of earthenware, porcelain and other similar substances, whereby such moulds are rendered more durable.

Instead of making the mould of one substance or material throughout as heretofore, the face of the mould which gives the shape or form to the article to be moulded, is composed of a thin layer of the substance, technically called "Pitcher," by potters: consisting of a mixture of about eight parts by weight of flint, two and a half parts of blue clay, and one part of china clay. This layer being baked, is afterwards backed or strengthened by a composition of three parts sand, two of roman cement and one of plaster of Paris, mixed with water. The patentee does not confine himself to the exact proportions either of the "Pitcher" or the "Back," but claims the union, or combination of the two parts—the *pitcher* face and a composition mixed or metal *back* to form moulds used in the manufacture of earthenware, porcelain, &c.—Rolls Chapel Office, July 3, 1840.

Edmund Rudge, jun., of Tewkesbury, tanner, for a method or methods of obtaining power for locomotive and other purposes, and of applying the same.

The invention herein claimed, is the construction, and application of a new form of

atmospheric engine to various useful purposes. The engine may consist of two, three, or more open-topped cylinders, placed either vertically or horizontally, connected with a two or three throw crank; steam being admitted below the piston, is condensed, which brings the atmospheric pressure into action. The valves may be of any of the usual kind; suitable condensers, injection-pipes, and air-pumps are employed, and the preponderating influence of the air on the external surface of the several pistons in succession, produces the available power. If the cylinders are placed horizontally, the lubrication is effected by means of a small funnel on the top of the piston-rod, from whence the oil flows into a hollow space within the rod, and thence into a groove turned in the piston. It is a desideratum, for locomotive purposes, to have additional power in reserve for occasional use, and it is proposed to provide such power, by means of compressed air, to be obtained and applied by a supplementary apparatus. This apparatus consists of a large cylindrical receiver placed in a horizontal position, with a condensing air-pump on either side connected with the main crank of the engine. When the power of the engine is in excess as compared with its work, as in descending inclined planes, &c., the air-pumps will be thrown into gearing, and the receiver become filled with highly condensed air. Whenever the work presses upon the engine, as in ascending inclines, &c., a communication will be opened between the receiver and a working cylinder placed on the top of it, the piston-rod of which is connected with the driving-shaft of the engine. The condensed air being admitted alternately before and behind the piston by a D valve, as in steam engines, gives motion to the piston, which, acting upon the main crank of the carriage, gives out the power thus treasured up for such exigencies. A fuller description with an engraving of this supplementary apparatus we propose to give in an early number. The advantages claimed for these patented inventions are, a reduction in the size of the boiler, and greater economy in working, as compared with former methods. —Enrolment Office, August 8, 1840.

Joseph Needham Taylor, of Plymouth, Captain in the Royal Navy; for improvements in steam-boats and vessels.

This patent comprises two distinct contrivances; the first is a shield or guard to protect the paddle-wheels from the shocks of the sea, while the vessel is lying at anchor, or when sailing, or scudding under canvass—the steam power not being employed; the second is a method of applying the power of the steam-engine to work the windlass for weighing the anchor or other purposes.

The guard or shield consists of a series of arms and cross-bars, covered with iron plates arranged in a semicylindrical form, so as always to cover half of the paddle-wheel; on the inner rim of this shield, the segment of a cogged wheel is firmly bolted—the whole turning freely upon the paddle-shaft. A shaft lies across the top of the paddle-box, carrying a toothed wheel and also a pulley; the toothed wheel gears into the segment of the cogged wheel before mentioned, and on being turned, causes the shield also to turn upon the paddle-shaft. A strong chain passing over the pulley is bolted to the extremity of the shield, to insure greater strength and steadiness, and small toothed wheels are bolted to the sides of the vessel for the same purpose. On turning this shaft, the shield can be lowered so as to cover the paddles, either forward or abaft, when at anchor—or one shield may be lowered either on the starboard or the larboard side to assist in tacking or veering. In order to convey the power of the steam to the windlass, an endless chain or messenger is employed, which by means of suitable gearing and clutch-boxes, &c., gives motion to the windlass; all the arrangements necessary for this purpose are very minutely detailed, but the foregoing is sufficient to convey a general idea of the patentee's object.—Enrolment Office, Aug. 5th, 1840.

James Hancock, of Gloucester-place, Walworth, for a method of forming a fabric or fabrics applicable to various uses, by combining caoutchouc or certain compounds thereof with wood, whalebone, or other fibrous materials, vegetable or animal, manufactured or prepared for that purpose, or with metallic substances manufactured or prepared. This invention consists in producing a substance composed of a thin film of caoutchouc supported by any of the substances enumerated in the above title. The process is exemplified by a description of the manner of thus producing a substance suitable for the sheathing of ships, and other purposes. Strips of whalebone, $\frac{1}{4}$ of an inch wide, and $\frac{1}{30}$ or $\frac{1}{40}$ of an inch in thickness, are platted in the usual manner, leaving interstices of about $\frac{1}{4}$ of an inch between each strip. Pieces of felt are then taken and saturated with the caoutchouc composition, hereafter described, in the following manner:—Two rollers of wood, metal, or padded, work in metal bearings within a trough containing the composition, kept at a proper temperature by means of a steam bath; the felt is passed into the composition and between these rollers, from whence it goes between and over other rollers which in the first place drive off the exuberant composition, and subsequently press and

finish the fabric. Two of these felts in a "tacky" or "sticky" state, having a sheet of the platted whalebone placed between them, are submitted to strong pressure, by which means the mass becomes coherent, and when sufficiently dry may be used as a sheathing for ships, for roofing, &c. For roofing, however, the patentee prefers employing scaleboard strips platted, either in pieces of moderate dimensions, or in one piece the size of the roof required. A claim is also made to the employment of strips of metal, or of wire (copper being preferred) whenever such may be considered advantageous. For roofing purposes, both of the felts may be covered with the composition, or one only may be so covered. Fabrics of whalebone plat, covered with muslin, silk, paper, or common sheet caoutchouc, are also described, but it is essential that they be covered with the patent composition, the formation of which is briefly as follows:—Caoutchouc is to be steeped in coal tar, oil, or oil of turpentine, or a mixture of both, sufficient to dissolve it; it is then to be strained and mixed with pitch and Archangel, or Stockholm tar, in the proportion of one part of caoutchouc to eleven parts of the pitch, &c., applied as before described, and finished by the application of pressure by means of rollers or other convenient methods. The fabrics so produced are described as being eligible for the pannels and roofs of coaches, tilts for waggons, &c., military caps, sword scabbards, cartouch boxes, &c. &c.—Enrolment Office, August 8th, 1840.

Crofton William Moat, of Thistle-grove, Brompton, Esq., for a new and improved method of applying steam power to carriages on ordinary roads.

This is proposed to be accomplished by certain novel constructions and arrangements of the boiler, engine, and carriage, comprehended under the following heads:—1st. A peculiar mode of supporting the engine, &c. upon one pair of wheels, and of supporting the passenger-carriage upon another pair of wheels behind. 2nd. Applying the propelling power to the front pair of wheels, or to a central driving wheel placed under the axle of the front wheels. 3rd. A mode by which the fore wheels are enabled to turn independently of each other.

The boiler is divided into compartments by perpendicular partitions, there are two furnaces within the boiler, the flues of which pass through the boiler and steam-chamber. There are two working cylinders, placed horizontally, connected with a double crank. The periphery of the driving wheel is kept in contact with the ground, by means of its spokes being elastic, or by its axle hanging upon springs in a slotted bearing; a pump in connection with and worked by the crank forces a supply of water from a portable tank into the boiler. The relative weight or bearing of the engine upon the running or driving wheels is regulated by a vertical screw.

The after carriage for passengers, luggage, &c. is supported upon frame work connected to the fore carriage by a perch and perch-bolt in the usual manner.

In another arrangement, a tubular boiler with partitions is adopted; the engine in this case is carried upon the small running wheels, the driving wheel having rigid spokes, and its axle turning in a slotted bearing; or the power is applied directly to the running wheels, and the fore carriage is connected to the passenger carriage by a "segment piece." Two working cylinders are here adapted to each running wheel, one being placed vertically, the other horizontally, so as to act at right angles to each other, and to allow the two pistons to work upon one crank, which conveys its motion to the driving wheel by means of toothed gearing. The whole of the machinery is supported upon springs in both cases; in the last arrangement both driving wheels are propelled independently, and one or both may at any time be disconnected from the engine. Arrangements for stopping or reversing the motion of the engine, and for performing other necessary evolutions, are very fully explained.—Rolls Chapel Office, August 5th, 1840.

THE RIVAL STEAMERS.

Sir,—The notices of the *Eclipse* and *Fire King* steamers, at pages 110 and 141 of your July part, are neither of them complete. The power of the engine in the *Eclipse* is given, but not her dimensions. From her appearance when at Deptford I should suppose her to be scarcely, if at all, larger than the *Sons of the Thames*, and, if so, her power is much greater in proportion to her tonnage than any boat afloat, whilst, if I am correctly informed, her draft of water is considerably under three feet. These circumstances are sufficient to account for a high velocity without calling in the aid of high-pressure steam. Can any of your correspondents furnish the dimensions of the boat, draft of water, the diameter of her wheels, and number of revolutions per minute? I have heard strange reports of her speed, but have not yet had the good fortune to see her under weigh.

The notice of the *Fire King* is also incomplete. It gives the dimensions of the hull as to length, breadth, and depth, but omits the draft of water, the power of the engines,

diameter of the paddle-wheels, and number of revolutions per minute. Can any of your correspondents supply the deficient information?

Looking at the details of the eight trial miles, there appears to be a great variation in the *Fire King's* velocity between the 2nd (16,14 miles) and the 8th, (which is only 14,06 miles.) To what is this attributable? I have somewhere seen it stated that there was no perceptible tide in that part of the Gare Loch when the trial was made, and that it was calm or nearly so. If this be correct the variation is the more remarkable. From my knowledge of Mr. R. Napier, I feel confident that he is not the man to impose upon the public by selected instances, and the other gentlemen present, Messrs. John Wood, Lloyd, Russell, and Alexander Gordon would not, I am equally confident, have attempted any such thing. The *Fire King* is a large steamer and with the same proportion of power to tonnage must go faster than a smaller vessel.

The recent experimental voyage of the *Archimedes* must be highly satisfactory to her ingenious inventor, Mr. Smith, as completely demonstrating the efficiency of the screw propeller in a sea way. Would not vessels upon this principle be extremely well adapted for the passage to the East Indies by the Cape of Good Hope?

The challenge to run the *Ruby* against any vessel afloat has it appears been accepted—but Mr. Billings has it appears backed the *Ruby* out. How is this? Is he conscious that his boasted beating of the *Orwell* is all smoke? I believe it to have been so, because on a recent passage I was on board the *Orwell* coming up the river past Gravesend, when the *Ruby* started, and the two boats kept very nearly the same distance from each other, although the *Orwell* had then a full freight of passengers, and as much cargo in as put her ten inches lower in the water than her proper water line; I find too, on inquiry, that at the time when the *Ruby* is said to have beaten her so much, she (the *Orwell*) was then down in the water to about the same draft, whilst the *Ruby* had neither passengers nor cargo on board—which at the time was said to be to the disadvantage of the *Ruby*. *Credat Judæus!*

I am, Sir,

Yours, respectfully,

GEORGE BAYLEY.

London, August 8, 1840.

WINDOWS OF MICA.

In the windows of the workshops at the Butterly Iron Works so much glass was broken by the chippings of iron, that a substitute was sought which should resist a moderate blow, and yet be translucent. A quantity of sheets of mica were procured from Calcutta, which, when fixed into the cast-iron window frames, were found to resist the blow of a chipping of iron driven off by the chisel with such force as would have shivered a pane of glass. Mica possesses both toughness and elasticity, and when a piece of iron does penetrate it, merely a hole is made large enough to allow the piece to pass, while the other parts remain uninjured. It is not quite so transparent as glass, but it is not so much less so to be objectionable; but this circumstance is not important at Butterly, as, in consequence of the quantity of fluoric acid gas evolved from the fluate of lime used as a flux in the blast furnaces, the glass in the windows is speedily acted upon, and assumes the appearance of being ground. Mica is a little more expensive than common glass; but, as its duration promises to be much longer, it must be more economical; and if an extensive use of it could be induced, a more ready supply would be obtained—probably from Pennsylvania or from Russia, where it is commonly used for windows in farm-houses, and also on board ships of war, as it is less liable to be fractured by the concussion of the air during the discharge of heavy artillery. It can be procured of almost any dimensions necessary for ordinary purposes, as it has been found in Russia in masses of nearly three feet diameter. It is susceptible of very minute subdivision, as according to Haüy, it may be divided into plates no thicker than one three-hundred-thousandth part of an inch.—*Mr. Jos. Glynn—Trans. of Inst. of Civ. Eng.*

NEW SYSTEM OF LOCKAGE FOR CANALS.

To avoid the present expensive construction of locks and their waste of water, Mr. Smith, of Deenston, proposes to divide the canal into a series of basins, the water levels of which should be from 12 to 18 inches above each other. The extremity of each basin is so contracted as to permit only the free passage of a boat; in this is placed a single gate, hinged to a sill across the bottom, the head pointing at a given angle against the stream, and the lateral faces pressing against rabbets in the masonry. The gate is to be constructed of buoyant materials, or made hollow so as to float and be held up by the pressure of the water in the higher level; on the top is a roller to facilitate the passage of the boats. When a boat is required to pass from a higher to a lower level, the bow end, which must be armed with an inclined projection, depresses the

gate as much as the depth of the immersion of the boat, and as much water escapes as can pass between its sides and the walls of the contracted part of the basin. The same action takes place in ascending, except that a certain amount of power must be expended to enable the boat to surmount the difference of level between the basins. The quantity of water wasted by each boat would be in proportion to its immersion and the speed at which it passed over the gate. In case of different sized boats passing along the same canal, it is proposed to have a small gate forming part of the main gate, so as to avoid the loss of water which would ensue from the whole width being open for the passage of a small boat. This system has only been tried by models; but it is proposed to make an essay on an extensive canal next summer, when the results will be communicated to the Insitution.—*Trans. of Inst. Civ. Eng.*

NOTES AND NOTICES.

Improved Air Thermometer.—At a recent meeting of the Royal Irish Academy, Dr. Apjohn, on the part of Surgeon Grimshaw, drew the attention of the members to a modification of the air-thermometer recently devised by the latter gentleman. The objections to the ordinary air-thermometer are well known. An idea of Mr. Grimshaw's improvement may be simply conveyed by describing his instrument as a differential thermometer, in the cool ball of which is placed a barometer, while to the side of the same ball a little syringe is attached, by beams of which air may be pumped in or out, and the elasticity of the included air thus rendered invariably the same, before the temperature (exhibited upon the scale of equal parts attached to the stem in connexion with the hot ball) is registered. Dr. Apjohn observed, that Mr. Grimshaw intended attaching to his thermometer a provision for keeping the barometer vertical; and marking upon this latter instrument two additional points of constant pressure,—one higher, the other lower, than the atmospheric standard,—by the use of which, when necessary, the scale of the instrument may be greatly extended, so as to comprehend with ease the entire of the atmospheric range of temperature.

New Kind of Tin Plate.—M. Brady has formed a superior tin plate of iron and nickel. It is five or six times harder than that now in use, and is very advantageous for culinary utensils, as it does not communicate any colour to sauces, which common tin plate frequently does.

Composition of Wool.—Chevreul has lately examined wool with a practical view in dyeing. He has found that wool when washed with distilled water contains at least three immediate principles; 1st, a fatty substance, solid at the ordinary temperature and perfectly liquid at 140°; 2nd, a fatty substance, liquid at the temperature of 59°; 3rd, a filamentous substance, constituting the wool properly so called. He has come to this conclusion because the filamentous matter disengages sulphur or hydro-sulphuric acid without losing its essential and characteristic properties, and hence it appears to him probable that the sulphur enters as an element into the composition of a substance quite distinct from the filamentous body.

The Electrotype in America.—This important discovery of multiplying copper-plate engravings, medals, &c., by precipitating copper from its solutions through the agency of galvanism, is fast progressing in this country. Joseph Saxton and Mr. Peale, of the Philadelphia Mint; and Messrs. Chilton, Mapes and Connor of this city have made many improvements on the English process. Dr. Chilton has caused copper to be precipitated on *non-metallic* bodies even, by covering the paper with nitrate of silver, and thus obtaining a copper-plate engraving from a mere print of paper.—*New York Herald.*

Progress of Aerostation.—It affords us great gratification to be able to announce to the lovers of scientific improvement in this exceedingly beautiful department of practical natural philosophy, that Mr. Green, the celebrated aeronaut, intends publishing a work on Aerostation, developing its progressive improvement from the time he devoted himself to it as a profession. Such a work from so great a master of the art will be one of universal interest, and we have no doubt will be translated into the languages of every country in Europe. In addition to Mr. Green's intended flight across the Atlantic from America to Europe—we know that he has it in contemplation as a minor excursion, to ascend from Dublin next summer and to cross over England to the continent of Europe. We have no doubt that our Irish neighbours will give ardent encouragement to this public spirited enterprise.

Cigar Smoking on Railways.—Our readers may recollect that an appeal was recently made to railway directors by a correspondent of ours, on behalf of cigar smokers, for whose especial use it was recommended that one carriage in each train should be provided. It appears that on the Belgian railways some plan of the kind is about to be introduced, as carriages are now in the course of construction, to be called "smoking diligences." Tobacco-smoking is certainly more general on the continent than in this country, but even here there would probably be little difficulty in finding occupants for these smoking carriages. The public taste is becoming fastidious in respect of travelling accommodations—will "smoking diligences" be the next indulgence asked for and granted?—*Railway Times.* "Asked for" they may be, but how "granted," since it is a provision in all railway acts that "every engine shall consume its own smoke"?

The Gun Manufactures of Liege.—Liege is also the centre of a manufacture of fire-arms, which is universally renowned. About fifty factories of these articles are constantly active, and their produce is largely exported to America, Egypt, Turkey, Germany, Italy, and Spain. In the United States of America, the rifles and fowling-guns of Liege are preferred to those of Birmingham. From 25,000 to 30,000 guns are annually exported to Brazil alone. The principal kinds manufactured are,—1, single and double barrelled guns for sporting; 2, muskets for military use; 3, common guns for various purposes; 4, pistols, which, as well as the best description of guns, are made and finished with great care and skill. The number of guns of different kinds manufactured at Liege in 1836 was 256,079, and of pistols, 92,400; total, 349,379. The value of these is estimated at nearly 7,000,000 francs. The produce of the gun factories of Liege exceeds that of the whole of France, and in the number of articles it is superior to that of Birmingham.—*McCulloch.*

Life Preserving Hat.—An aquatic hat is now in course of exhibition at the Polytechnic Institution, and in practical operation every morning in the Serpentine river, by Mr. Williams, the active superintendent of the Royal Humane Society. It may be in the recollection of many of our readers, that this adaptation of hats to the preservation of life from drowning, has been suggested by more than one correspondent in our pages—among others by Mr. Michael Rough.

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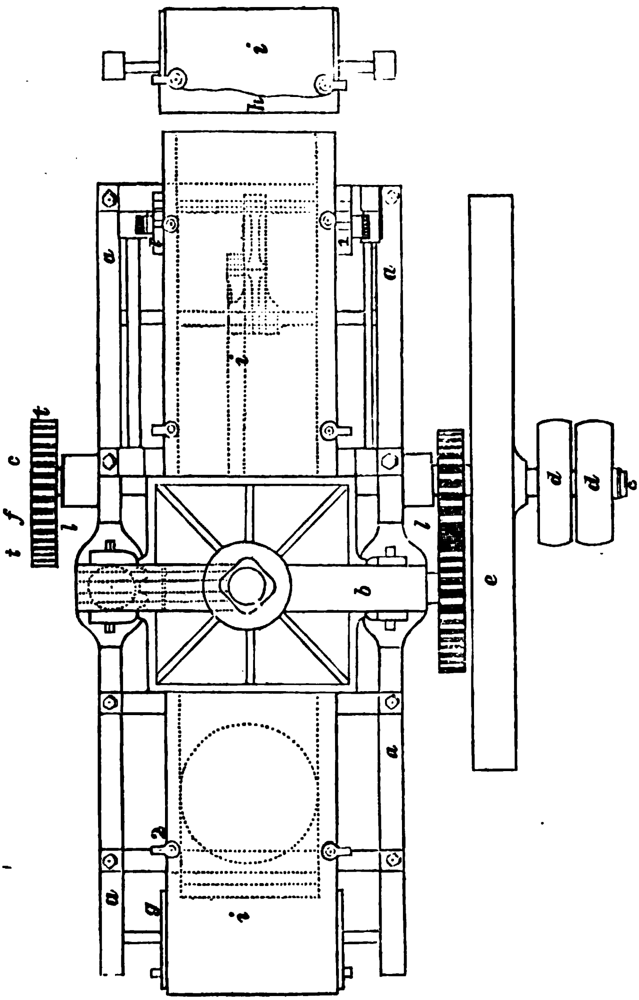
RIDGWAY AND WALL'S PATENT IMPROVEMENTS IN THE MANUFACTURE OF CHINA AND EARTHENWARE.

Fig. 2.



RIDGWAY AND WALL'S PATENT IMPROVEMENTS IN THE MANUFACTURE OF CHINA, ETC.

Messrs. Ridgway and Wall have recently patented some improvements in the manufacture of china and earthenware, a description of which we have now the pleasure of laying before our readers. In our last week's number, we gave an abstract from Mr. Ridgway's patent for certain improvements in the *moulds* used in this manufacture; the improvements now about to be noticed, consist in the employment of a pair of double moulds, or dies, (*i. e.*, exterior and interior) for forming the various articles, and pressing such moulds together by means of self-acting machinery, driven by steam or other suitable power. The principal object of this invention is to perform the several processes of feeding the press, closing the dies to form the article to be manufactured, and removing the moulds containing the articles so formed, by means of self-acting machinery or apparatus, instead of manual labour.

Fig. 1 is a side elevation, and fig. 2 a horizontal view of the machine designed for this purpose, both of which are marked with similar letters of reference throughout.

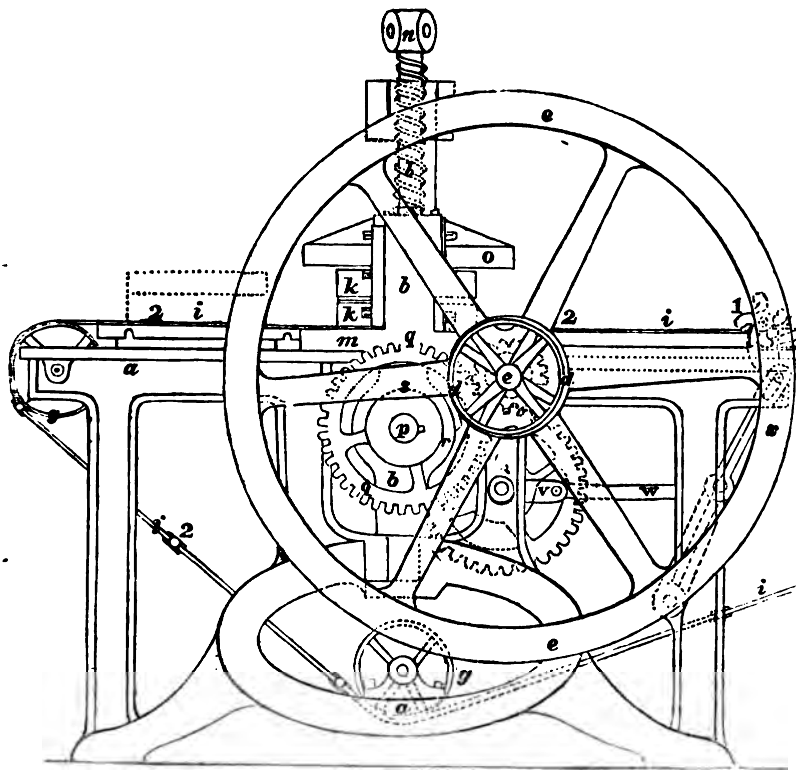
The main framing or standards are shown at *a a a*, supporting the press or head framing *b b b*. The main or driving shaft, *c c*, is mounted in the frame *a a*, carrying the driving pullies *d d*, the fly-wheel *e*, and also the driving pinions *f f*; conducting or tension rollers *g g*, are also supported by the main framing; another tension roller *h* is supported by a bracket at any suitable distance. The rollers *g* and *h* are for the purpose of conducting the feeding or delivering strap *i i*, which carries the pair of moulds *k k*, through the machine. The head framing, *b b*, is furnished with planed parallel sides, *l l*, for the press table *m* to rise and fall in, and also with the set screw *n*, for the purpose of adjusting the press head *o*, and thus regulating the pressure upon the moulds *k k*. The press head *o*, or the press table *m*, being furnished, if necessary, with springs to give elasticity to the pressure.

A cross shaft, *p*, is also mounted in the head framing *b b*, which carries on its end the toothed wheel *q* gearing with one of the driving pinions *f*, and thus actuating the cam or eccentric *r*, which is keyed upon the middle of the shaft *p*, and as it revolves acts against a projection *s*, upon the under side of the press table *m*. This being the general construction of the apparatus, its operation is as follows: Motion being communicated by a steam-engine or other suitable power, by means of a belt to the fast pulley *d*, a pair of moulds, *k*, are placed upon the feeding strap *i i*, with a bat of clay between them; one of the driving pinions *f*, will actuate the spur-wheel *t*, upon the smaller cross-shaft *u*, and thus by means of a crank *v*, and connecting rod *w*, vibrate the radial arm *x*, which, being connected with the carrier piece *y*, will slide it along the two guide rods *z z*, and cause the catch-wheels 1 1, to strike against the stops 2 2, upon the strap *i*, and thus turn the catch one-fourth of a revolution, when the hooked catches upon it will fall against the stops, and as the sliding carrier *y y*, returns by the next vibration of the arm *x*, will thus cause the strap *i i*, to advance a certain distance, until the moulds, *k k*, are brought exactly under the centre of the press, when the pin, or catch, escapes from the stop upon the strap *i*, and thus leaves it stationary. At this time the eccentric part of the cam *l* will arrive at the perpendicular, and by acting against the projection *s* upon the under side of the table *m*, thus force the table upwards, giving the requisite pressure to the mould *k k*, and causing the clay between them to be impressed with the form or shape required. After the pressing has been completed, the strap again advances as before, and conducts the moulds with the articles thus formed into the room to be properly dried and finished.

From the foregoing description, it will be evident, that as the driving parts continue to revolve, the alternate operations of feeding in the moulds properly supplied with clay—pressing them to form the article of manufacture—and removing them from the machine, will thus be successively performed.

RIDGWAY AND WALL'S PATENT IMPROVEMENTS IN THE MANUFACTURE OF CHINA, ETC.

Fig. 1.



BLACK'S THEORY OF LATENT HEAT DEFENDED AGAINST THE OBJECTIONS OF W. A. K.—BY G. A. WIGNEY, ESQ.

Sir,—If the remarks of W. A. K., page 21, No. 878, of your 32nd volume, "On Dr. Black's Theory of Latent Heat," were not calculated to disseminate error, instead of eliciting and confirming truth, I should have refrained from troubling you with any observations of mine upon the subject; but when poison is infused, it becomes every one to endeavour to administer an antidote if he thinks he is able.

The first question propounded is, "Is there such a thing in nature as latent heat, except electricity?"

Now in order that I might be well satisfied, that I fully understood the meaning of the term latent, I referred to my Dictionary, and found the definition given—"secret, private, hidden, concealed, abstruseness." Whether or not the term "latent" is properly applied to heat, the presence of which in bodies, the thermometer will not indicate, I must leave others to determine; but to me it appears, that although not improperly applied, yet had the term *constituent* or *component* heat been substituted, W. A. K., and probably many others, would not have found it so abstruse (latent) a subject as he appears to have done.

It is far from being the least proof of the infinite wisdom of the great Creator of all things, that he has compounded them of a very few species or classes of

atoms; that the infinite variety of all substances in form, hue and properties, is due to the skilful arrangement of them, as to relative proportion and position, and that a definite amount of caloric forms one of the constituent classes.

In reference to water as an illustrative subject, it appears to me to be compounded of a definite proportion of oxygen, hydrogen and latent heat, as an integral body or substance, and a variable amount of free or sensible heat, ranging under atmospheric pressure, from 32° to 212°; and it does not follow, because Dr. Black says that water contains 810° of latent heat, and others say 1000°, that such a discrepancy as to the amount, is any proof, either that it contains no latent heat, or that what is supposed to be latent heat is electricity, as it appears to be the purport of W. A. K.'s communication to suggest, if not to prove.

The very useful Tables which the manufacturing classes, as well as the scientific, have been favoured with, furnishing the atomic composition of a variety of substances, as regards the relative proportion of their component classes of ponderable atoms, would be incalculably enhanced in value, if they also furnished the proportion as to amount of the component imponderable atoms; but we are yet, I apprehend, destitute of the all important power to retain after separation, such subtle and fugitive elementary principles, as to enable their admeasurement, and the correct appreciation of the amount.

Latent heat is, as its name implies, a secret or hidden heat, as well as a component heat, and not only of water, but of all other bodies, so far as relates to that portion, the presence of which, a thermometer will not detect or abstract; but it is not to be supposed that latent heat in any way differs in its properties from free or sensible heat, but that it differs in the circumstances of its presence in such substance, being there in combination with a definite proportion of the component ponderable atoms, as an ordained constituent for the formation of a peculiar substance; and although such heat has a natural and invariable tendency to immovable residence in each substance, while that substance exists as an integral body, yet it is at all times more subject to the powerful law of equal diffusion, than to that which may be termed the inert power of constituent composition, and hence it is difficult to divest bodies of their latent heat. I know indeed of no power that will permanently divest them of it, but such as is competent to, and will effect the destructive decomposition of an integral body, or that will temporarily divest them of it, but the law of equal diffusion to which heat is subject. Thus water may be decomposed, by separating the ponderable atoms of which it is composed, beyond the precincts of attraction of aggregation, by the impartation of a greater amount of heat than is sufficient for the constituent composition of steam; or water may be decomposed by the abstraction of one class of its constituent atoms; and in either case, being destroyed as an integral body, the latent heat which belonged to that body is liberated and escapes. But if water is converted into steam of the greatest rarity, and is not destroyed as an integral body, it is not divested of its latent heat; and whenever the free or sensible heat which has been imparted is again abstracted, and the ponderable atoms of which the water was and still is composed, are drawn together in proximate position by the power of aggregate attraction, it will be found that the original amount of latent heat remains, and its composition as an integral body (water) is unchanged.

Having stated, as an opinion, that both latent and free or sensible heat, are precisely the same in every respect,—that portion which is contained in a substance in a hidden state, being denominated latent, because a thermometer will not indicate its presence, and that portion which such instrument will detect being denominated free or sensible heat, because it is subject to transition, to the extent of a state of equality, from the substance to the mercury of the thermometer—I wish it to be here understood, that I do not think that precisely the same latent heat is resident in any substance as to identity, but merely as to amount, as a necessary constituent portion.

The latent heat of bodies, I conceive, can neither be diminished nor increased as relates to their integral composition, yet it may be temporarily diminished, and then its integrity no longer exists; but the moment the abstracting cause is removed, the body will recover its con-

stituent amount of latent heat from surrounding media, and although not precisely the same latent heat which it originally possessed, yet precisely the same amount. Thus in the congelation of water, if it is exposed to atmospheric air of a lower temperature than 32°, it will first lose as much free or sensible heat as it possesses above 32°, in obedience to the law of equal diffusion, and the loss beyond is latent heat, rendered active by the power of the law of equal diffusion; and every portion of the amount of latent heat, is an abstraction of its constituent imponderable atoms, and consequently a partial destruction of its integral state and condition as water; and if the abstraction is sufficiently continued, its annihilation as an integral body (water) is effected, and it has assumed a new body, denominated ice. When the abstracting cause ceases, a gradual resumption of the constituent amount of latent heat will occur, derived from the superincumbent atmosphere or other source, and water in its integral and original state will re-appear.

The fluidity of water is doubtlessly due to the amount of its constituent latent heat, and not to the properties of its latent heat, inasmuch as the amount required to preserve its fluidity is sufficient to prevent its ponderable atoms from being united by attraction of cohesion; and to render water solid, nothing more is needed, than the abstraction of such an amount of its latent heat, as will enable the ponderable atoms of which it is partly composed, to cohere together, as induced by attraction.

W. A. K. assumes, "that water then in its natural state, the same as all other bodies, would inevitably be solid, if it did not receive a sufficient quantity of exterior heat to render it fluid, and solid it would continue when it loses it, if it did not again acquire a similar amount." But to me it appears, that water in a natural state, as applied to its general and prevalent condition, is fluid; and in its unnatural state as applied to its minor prevalency or distribution, its condition is either solid or gaseous; and that it is due to the wise and salutary law of equal diffusion, to which the Creator of all things, has for the benefit of his creatures, rendered latent heat subject, that we are indebted for the occasional conversion of water from its natural fluid state, to an unnatural (if it may be so termed) solid or gaseous state.

The question which W. A. K. submits, "If therefore it acquires heat and parts with it, how can it be said to contain latent heat at all?" I think I have sufficiently replied to, in my endeavour to prove, that what is termed latent heat, is constituent heat, and that its denomination as "latent," is to be attributed to the incapability of any instrument we possess to ascertain its presence.

The hyperbolical statement, that water said to possess 1000° of latent heat, is when drawn from a well so cold, either in winter or summer, as almost to freeze one's fingers, deserves no other notice, than as a reference to it, serves the opportunity to state, that the temperature of well water is nearly the same both winter and summer—that its average temperature is about 50°—that such uniformity of temperature is to be attributed to the same uniformity of temperature of the earth—and that to the latter may justly be ascribed, the fluidity of water as its natural condition throughout the major part of the earth's surface, while to the low temperature of the atmosphere surrounding the minor portion, is to be attributed the solidity of water, as its unnatural (a contradistinguishing appellative) condition.

Having, I trust, already proved that the theory of latent heat is tenable, I may pass his question of relative inquiry, and proceed to his next subject,—the evolution of latent heat, resulting from the combination of sulphuric acid and water. If equal parts, or any definite quantity of sulphuric acid and water are mixed together, each in its separate state at any thermometric temperature, the mixture will not be equal in quantity to the two fluids in a separate state, and the thermometric temperature of the mixture will be much above the mean temperature of the fluids when separate; and the latent heat which is disengaged and converted into active heat, may be sufficiently intense under some circumstances, as W. A. K. observes, to burst a jar or bottle. Such an effect is to be attributed to the circumstance, that the constituent amount of the latent heat of sulphuric acid and of water in their separate states, is much greater than the constituent amount of latent heat, appertaining to a mixture of those

fluids, and consequently in obedience to that law, which has apportioned to each substance their respective portions of constituent latent heat, so the superfluous amount of constituent latent heat for the mixture, as contained in the two fluids separately, is evolved when their admixture is effected; and as its presence in the two fluids in a separate state, constituted a portion of their bulk, so its absence, when in a state of mixture, causes a diminution of the mean bulk; while the latent heat evolved, for a short period increases the thermometric temperature of the mixture, and the rapidity of its disengagement, effecting the sudden pressure on the jar or bottle, may cause it to burst, before it has time to escape through its substance to the atmosphere; and the subsidence, or ultimate diminution of the thermometric heat of the mixture, is to be attributed to its transition to the surrounding media, agreeably to the law of equal diffusion.

The friction of metals, or any other substance, will in part effect their decomposition, by a separation of a portion of their constituent ponderable atoms; and as the constituent latent heat of such bodies, lies in the interstices presented by the cohesive combination of the ponderable atoms, (which are supposed to be spherical) so the separation of every ponderable atom by abrasion from that body, must liberate the latent heat appertaining to that atom, and thus render it free to experience the evolution which occurs; and again, the diminution in bulk of metals, by a change of their mechanical structure, resulting from compression or percussion, will necessarily cause an extrication of a portion of latent heat, by causing the ponderable atoms of which it is composed, to unite in closer arrangement than before.

The bar of iron heated red, "throwing its scintillations of melted metal in every direction" acquires its increased thermometric temperature, by the transfer of the latent heat of the fuel in combustion, to the iron, to the extent prescribed by the law of equal diffusion; and if such bar were merely heated and allowed to cool again, without being subject to percussion by the hammer, it would lose no more latent heat, than would result from a partial decomposition of the iron by oxidation; but when the hammer is applied, producing the scintillations mentioned, decomposition of the iron to a much greater extent occurs, and consequently a much greater amount of latent heat is lost. Again this loss of latent heat is in proportion to the extent of decomposition resulting, and the diminution of the bulk of the remaining iron by percussion—the latter process rendering the iron of a closer texture, or in other words, compressing its constituent atoms into closer contact and a smaller space, and at the same time forcing out the latent heat, which was previously a constituent resident in the cellular pores, which W. A. K. supposes to be filled with air exclusively electrical.

Any additional heat which may be imparted to a metal, beyond the amount of latent heat which it naturally possesses, will first completely fill all the cellular cavities, which may be presented by its mechanical structure, before any expansion of that metal can occur, and any impartation of heat beyond a sufficiency to effect that purpose, will cause an expansion of the metal in proportion to the amount imparted, by a separation of its constituent atoms from each other, and the subsequent abstraction of such imparted heat, will admit of the reunion of those ponderable atoms subject to the law of attraction, and thereby the contraction of the metal will be effected, and in this operation both of expansion and contraction, the latent heat of the metal is passive. Again, supposing that the pores were filled with air instead of latent and active heat as W. A. K. supposes, yet he has to prove, that such air possesses no latent heat, before he will be able to prove the theory of Dr. Black erroneous.

The facility with which the liquefaction of various bodies is effected, is proportionate to the amount of constituent latent heat which each possesses—those possessing most, being liquefied the easiest; for as all bodies are compounded of ponderable atoms, and the imponderable atoms of heat, and as the specific gravity of a body, is proportionate to the amount of its constituent ponderable atoms, and as the force of attraction of cohesion exerted upon the ponderable atoms, is proportionate to their distance from each other, so any body compounded of the greatest number of ponderable atoms within a given space, is

with more difficulty liquefied than a body compounded of less amount; for the liquefaction of a solid, is effected by the impartation of thermometric, or free or sensible heat, to a sufficient amount, to overpower the attraction of cohesion, by which the ponderable atoms of the solid are united, and by the intervention of atoms of heat to separate them from each other, and thus enable each atom to revolve upon its own axis, (the necessary condition to fluidity.) It therefore follows, as a matter of course, that the greater the specific gravity of a metal, the greater is the amount of its constituent ponderable atoms, contained within a given space, and consequently, the closer the proximity of their arrangement; therefore the greater is the force of attraction of cohesion which unites them, and as a final consequence, the greater is the power required to separate them.

The explosion of gunpowder causes its decomposition, and if the theory which I have undertaken to defend is correct, its decomposition must release and dissipate its latent heat.

To effect the decomposition of a body, it appears to be necessary to communicate to that body to be decomposed, some portion of the atoms of a body in a state of decomposition, and which are separate from it as the result of decomposition. Thus the latent heat of fuel in a state of decomposition resulting from its combustion, will effect the decomposition of other bodies. The carbonic acid gas, liberated from yeast in a state of decomposition, will effect the decomposition of wort, with which it is blended; and the spark resulting from the decomposition of the electric fluid, which will fire gunpowder, will cause its decomposition, while the undecomposed electric fluid passed through it by means of a conductor, will not effect the purpose.

But what in such case, has electricity to do with latent heat, unless the electric fluid being first decomposed, its own latent heat is liberated, and being superadded to the latent heat of the gunpowder, causes its decomposition also, and the consequent liberation of the latent heat of the latter?

As my purpose, in this letter, is solely to defend the theory of latent heat, and as the remainder of W. A. K.'s letter, does not contain any serious attack on it, I will refrain from further observations, and am

Sir,

Your obedient servant,

G. A. Wigney.

Brighton, July, 1840.

P. S. If leisure permit me, by the time Mr. Prater returns from his tour, I will reply to his replication contained in No. 880 of your work.

THE "TRIAL OF STRENGTH" BETWEEN THE "ARCHIMEDES" AND "WILLIAM GUNSTON."

Sir,—I transmitted a paper last week relative to the trial between the *Archimedes* and *William Gunston*, to one of the proprietors of the former vessel, of which the following is a "copy," and if it should be considered deserving of publicity, I shall feel obliged by your giving it insertion in your columns.

The Archimedean Screw v. *Paddle Wheels.*

To Jas. W——t, Esq.

Sir,—Many individuals have entertained the project of applying the screw as a propeller at various times, and from having done so myself nearly twenty years ago, and often suggested it since, I feel in a scientific point of view great interest in its fate. I have read, therefore, with much regret, an account of the unfortunate and ill-advised attempt, to say the least of it, at an experiment intended, I presume, to test its power between the *Archimedes* and *William Gunston* steam tug. I say ill-advised, because it could scarcely have had any other result; and unfortunate, because it cannot fail to prejudice the public mind materially against the invention. Indeed, I find it very generally considered a failure in consequence, though it proves nothing in my estimation, further than that the promoters of the experiment knew but little of the properties of the screw, or they never would have risked the trial by which the power of the *Archimedes* became, as might have been feared, so completely prostrated, that instead of restraining the *William Gunston* to some reduced rate of speed (which would have been the case if both vessels had been fitted with wheels to a velocity due to the difference of power) the hap-

less *Archimedes* offered no more resistance than a helpless log, notwithstanding her machinery was in full action, and making, I shrewdly guess from experience, even a greater number of revolutions than could be obtained under the usual circumstances. This result viewed superficially may appear a paradox, but in reality it could not have been otherwise, if the smallest degree of effect in excess happened to be in favour of the *William Gunston*. If, however, the excess had been with the *Archimedes*, the screw would have discharged its water and maintained its power from being able to move a-head towing the *William Gunston*, but the contrary being the case the *William Gunston* dragged her stern foremost in direct opposition to the water passing through the screw; consequently the discharge was diminished, the screw could no longer clear itself, and its propelling power was proportionally reduced. Thus relieved, the *William Gunston* would of course increase her speed, and which would go on accelerating, while the screw would continue to lose power in the same ratio, and the opposing water completely counteracted the discharge of the volume and rendered the screw a perfect nonentity in effect—revolving as powerless as a simple drum in the water, which it doubtless did in the recent experiment. Now, the only means for comparing the effect of the two modes correctly, is by fitting a pair of paddle wheels to the same boat and engines to which the screw is attached, and which the proprietors of the invention ought, in justice to themselves and the public, to do immediately.

I believe the screw, as a propeller, will be found second to nothing but the paddle wheel, and that as great an effect may even be obtained by the former as by the latter, but at a greater cost of power. What the difference will amount to, can only be ascertained by an actual trial of both means in the manner I have suggested, letting the points of comparison as regards the paddle be the mean effect produced on a voyage with the various degrees of dip to which paddles under such circumstances are subject; and secondly, the effect resulting from the most favourable depth of immersion. The power required by the screw to produce the same effect may possibly be found not much to exceed that required by paddle wheels *in a voyage*, (especially with machinery better adapted than that which the *Archimedes* possesses) from the disadvantage they labour under through the variation of dip; and if so the advantage which the screw offers over the common wheel for ships of war and ocean steaming generally, as well as for river navigation, will amply compensate such disadvantage, as the wind may be used as a primary as well as an auxiliary agent, to a far greater extent than is at present practicable in the one case, and consequently the consumption of fuel on the whole need not be increased, while the quiet manner in which vessels so fitted pass through the water, and the absence of those unsightly encumbrances, the paddle wheels and boxes, are advantages worthy some little sacrifice to obtain in the other. Beside, by working steam expansively to the *full extent* in marine engines, which will come into general practice ere long, and by which one-half at least of the fuel now consumed will be saved, the consumption of a little extra power will be a matter of minor importance.

I am, Sir,

Yours, most respectfully,

ALPHA.

Limehouse, August 10, 1840.

COMPARATIVE DIMENSIONS, &C. OF THE "ARCHIMEDES" AND "WILLIAM GUNSTON."

Sir,—For the satisfaction of your correspondent H, I have procured the following dimensions of the engines of the two vessels. The *William Gunston* has two engines, each cylinder being 27 inches in diameter, and length of stroke 3½ feet, and has cylindrical or rather oval boilers. The *Archimedes* has two engines, each cylinder 36 inches diameter, and 3 feet stroke; the boilers are square. The exact pressure per square inch I have not been able to ascertain, but I understand there is not much difference; besides, the power of an engine is not increased proportionally by increasing the steam pressure.

The power of the screw as a propeller has been investigated by Mr. Woolhouse, and a formula given for its calculation in Tredgold's work on the Steam Engine, appendix, page 23. Mr. W. has also I have been informed given it as his opinion that a propeller 20 feet in diameter would be

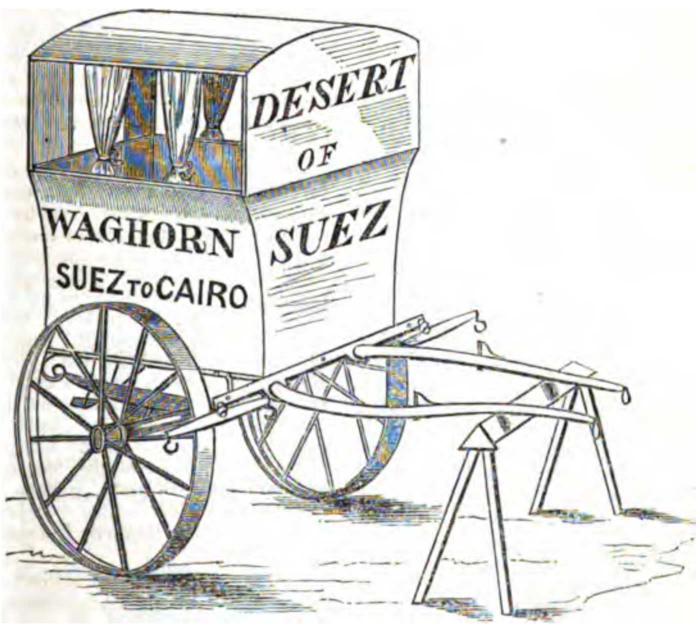
required to produce the same effect as the common wheel, and that the parts nearest the shaft should be cut out to a certain extent, for the resolved velocity of those parts in the direction of the motion of the boat would be less than the velocity of the boat, and would therefore retard rather than propel it.

As there is such a great disparity between the size of the engines of the two vessels, the area of the cylinders of the *Archimedes* being nearly double the area of those of the *William Gunston*, it is hard to account for the latter running away with the former, on any other principle but the propelling power of the common paddle wheel being greater than that of the screw.

I remain, Sir,
Yours, obediently,
OBSERVER.

August 17, 1840.

MR. WAGHORN'S IRON EXPRESS COACH FOR THE DESERT.



The extraordinary efforts now making to facilitate communication with our Eastern possessions, renders everything tending to promote that desirable object, of more than passing interest. Among those who have distinguished themselves by their energetic efforts to expedite the transmission of intelligence between India and England, Mr. Waghorn stands conspicuous. The route by way of Egypt is, it is well known, that, to the interests of which Mr. Waghorn has specially devoted himself, and so pre-eminently successful have his exertions for it been, that almost invariably the Waghorn Express anticipates the arrival of the Government and East India Company's messengers, by two whole days.

Mr. Waghorn has recently been in London, arranging and extending his plans, so as to accommodate the vast increase of commercial activity, and the great number of travellers who are constantly seeking to obtain, by his aid, the most rapid and easy mode of accomplishing the "toilsome journey" to or from India. In carrying out this object on a suitable scale, every difficulty that presented itself has been no sooner met, than surmounted; among these difficulties may be included the passage across the arid and scorching desert between Grand Cairo and Suez. Hitherto the only means of conveyance over these extensive and barren sands, has been by camels and dromedaries; an attempt was recently

made to adapt a wooden carriage to the journey, but it proved, as might have been foreseen, that carriages of this description are utterly useless in such situations; the intense heat and drought of those districts soon splitting and rending the best seasoned timber, so as to render any carriage composed of such materials, useless after a few days travelling. One journey across the great desert, it is said, would completely destroy any timber carriage, however well constructed.

British ingenuity has surmounted this seeming difficulty, in the same way as many others—by substituting *iron* for *wood*.

The prefixed engraving represents an iron express coach recently constructed for Mr. Waghorn, by Messrs. Theodore Jones, and Co., patent iron wheel manufacturers, of Spitalfields, partly from a design by Mr. Baddeley. This vehicle, which is adapted to hold six persons, has not a particle of wood in its construction; the frame is of bar iron, braced together by a judicious employment of iron rods and tubes. From the base, six upright iron rods support the roof; the seats along each side are supported by similar materials. A door of framed bar iron is placed behind. The floor is composed of a trellis work of thin hoop iron, with intervals of about two inches between, to allow the freest circulation of air; the seats are made in the same way, covered with comfortable hair cushions. There are two shafts in the centre formed of iron tubes, with swing bars on either side for the attachment of three "Arab steeds" running abreast, and driven by a postillion. The whole is placed upon two well-tempered springs, and the wheels are cylindrical, of wrought iron, upon the suspension principle.* The front, roof, and the sides, little more than breast high, are covered in with the best storm stay-sail canvass, with curtains above of the same. Before leaving this country the carriage was inspected by a great number of gentlemen connected with the East, and who, as occasional travellers,† were competent judges of what was required, and they one and all pronounced it to be admirably adapted for its intended purpose. Among its other excellences may be mentioned lightness, strength, free ventilation, and its entire indestructibility by atmospheric influences. It seems calculated when brought fully into operation, to be a safe and comfortable conveyance for travellers, despatches, and the lighter articles of commerce, and is likely to be the means of opening extensively that easy intercourse between Palestine, Persia, Arabia, and Egypt, which is greatly wanted, and would vastly extend the bounds of human knowledge, commerce, and civilization.

* A notice of the renewal of this patent appeared in our 883rd number.

† One gentleman stated that on a recent journey across the desert, he would willingly have paid a hundred pounds for the comfort afforded by this conveyance.

HALL'S CONDENSERS AND THE PETERSON VACUUM.

Sir,—In trespassing upon your columns, for the first time, I have little apology to offer—my motives being disinterested. I write solely with the view of removing the erroneous opinions which the communications of some of your correspondents are calculated to impress upon the public mind. "Thus far, and no farther," will I go with Mr. Hall's *manager*, Mr. Peterson. I am astonished to find that the "vacuum, in Hall's condensers" is not yet a settled point, after so much has been written on the subject during the last five years, and I beg to make a few remarks on the subject, suggested by a perusal of the May numbers of your Magazine, prefacing them by observing, that I am neither "prejudiced," "interested," nor "entirely ignorant of the subject."

I think the extraordinary vacuum (*said to be*) produced by Napier's engines in the *British Queen*, or taking the widest range possible, I will add the vacuum (said to be) produced in engines where Hall's condensers are used—is certainly unrivalled by any in the world—because the *said* vacuum is *more perfect* than a *perfect* vacuum, (allow me *one* bull!) If we are to believe all that Mr. Hall and his managers say on the subject, we must believe that this most perfect vacuum is due in a great measure to the patent condensers, but perhaps the perfection owes *a little* to the patent barometer, which Mr. Hall finds to suit his purpose so well, that when he asks an engineer to certify as to the height of the mercury he refuses to allow the common, or long barometer to be used. I know this to be a fact, in one case at least. Mr. Peterson says *rather* too much, when he says "the vacuum in the fastest boat on the Thames, never yet

exceeded 27½ inches." (I suppose he meant us to add—when they had Hall's condensers on board!) Now I have seen the vacuum in a boat, certainly *not* the fastest on the Thames, standing at 28¼ inches by the *long gauge*, when the *barometer* was at 29¼, thus proving that the vacuum in the condenser (not Hall's) was within 1¼ inches of being *perfect*. This difference between the condenser gauge, and the barometer is what I wish particularly to call attention to. It makes all the difference in the world, and seems never taken into account. Amongst all the certificates which Mr. Hall has published, only *one* (that of Mr. George Peel) gives the height of the *barometer*, which in the case referred to, was at 30.2 inches, when the condenser gauge was 28¼ inches, thus proving, that the vacuum was 2 inches from being perfect. Now, I believe the barometer in this country is *generally* about 29½—it is not often at 30½, and almost never at 31 inches. In the extracts from the log of the *British Queen*, which Mr. Peterson gives—the vacuum is never *stated* below 29 inches—in the one voyage it averages 29¾, and in the other about 30½ inches. Does Mr. Hall, or Mr. Peterson really wish the public to believe that the vacuum in his condenser is equal to between 29½ and 30½ inches? *I defy Mr. Hall, or any other person to prove that a vacuum of* 30 *inches has ever been obtained by means of his, or any other condenser*. Will Mr. Peterson, or Captain Roberts furnish you with the height of *the barometer* on board the *British Queen* between the 3rd and 18th of March, and the 2nd and 16th of April? If so, I will prove that those logs are erroneous. Captain Roberts, Mr. Peterson, and the other engineers whose names are attached to the certificate, that they "witnessed the mercury in Bedwell's patent barometer affixed to the engines of the steam-ship, *British Queen*, standing steadily at 30¼ inches"—show that they know very little of the subject upon which they have written. Perhaps, after all, the certificate *is true, if* the measurement is understood to be taken from *the kelson!!* It is utterly impossible that the condenser gauge can, if correct, show a greater height of mercury than the barometer—if it does, something must be wrong. Now are we to believe, that the barometer between the 2nd and 16th of April, stood as high as 31 to 31½ inches at least? The thing is absurd, impossible. Let Mr. Hall attach a long gauge to the best of his condensers and see what vacuum he can get. A gauge attached to the condenser of a steam-engine standing *steadily*, is something new, and to most of your readers must be rather incredible, especially when they consider that the vacuum is renewed and destroyed about 60 times in a minute. If it really does stand steadily, which, however, I do not believe, it is a *sure proof* that the vacuum is formed *very slowly*.

Since writing the above, I have looked over Mr. Hall's address to the British Association. In his letter to Dr. Lardner, page 6, he says, "Now to show you that my system of condensation is not only sufficiently sudden, *i. e.*, as sudden as condensation by injection; I will show you that it is even more sudden than condensation by injection, for you will see engines working upon my principle have a vacuum that will suspend a column of mercury of from 28 to 29½ inches, according to the state of the atmosphere, and that with the mercury not undulating more than half an inch! whereas, the vacuum produced by injection will generally cause the mercurial column attached to it, to undulate from 1 to 3 inches." Why, this very undulation is the best proof he could bring forward of the suddenness of the vacuum, if we are to understand that in both cases the gauge is the same, as it must be for a fair comparison.

A perusal of "Scalpel's" letter on this subject, in No. 877, calls to my recollection a question I wished to put to Mr. Hall, to which I request he will reply in an unequivocal and distinct manner—*Why have you, Mr. Hall, to suit your own purpose, given a part only of the certificate of Messrs. Lloyd and Kingston* relative to your condensers?

But to return to condensation—I will not follow "Scalpel's" example—but will try to condense what I have to say into as little space as possible, as I dare say your readers are tired of the subject, and I have not much time to spare. "Scalpel" says, "there are only two methods of performing the distinguishing characteristic of the low pressure or condensing engine, and upon the rapidity of effecting which, entirely depends its available duty: 1st, condensation by the usual injection—and, 2ndly, condensation by surface"—to both plans he states objections. "Scalpel" is "entirely ignorant of the subject upon which he writes"! (Peterson.) There is *another* mode of condensation—by injection—but not the usual plan of injecting impure water. I mean *Mr. Howard's* patent method of condensation. He condenses by injection—he cools the water, resulting from condensation and injection, by passing it through tubes surrounded by the cold, and it may be impure water—and *he again re-injects it*. The same water thus continually circulates through the boilers and engine, and his method effects all, and more than Mr. Hall pretends to, (except the vacuum of 30½ inches!)—the use of pure water in the boilers, &c., the sudden vacuum to be

obtained *only* by injection, saving of fuel, a *smaller* air-pump than usual, &c. I have heard Messrs. Lloyd and Kingston, Messrs. Maudslay and Field repeatedly say, that "*it was the most beautiful and perfect mode of condensation they ever saw.*" And it effects all this in a much more simple and less costly manner than Mr. Hall's. Yet your readers may ask, "How is it not adopted then?" I cannot account for it, except by supposing that the inventor does not "*blow off*" so much as some inventors do. I may, perhaps, give you an account of it in my *second* dispatch.

R. S. M.

Dundee, August 10, 1840.

P. S. From the manner in which I have mentioned Mr. Howard's invention, some of your readers may perhaps suppose, that I am interested in it, (I wish I were!) or even that *he* may be the author of *my* letter. I have nothing to do with Mr. Howard's invention, and he is not aware who the author is—he is "entirely ignorant of the matter upon which I write." I had almost forgot the 32 inch vacuum, until I began to fold up "my first dispatch!" I came down from London lately in one of the Dundee steamers, and was asking the engineer if he had had any thing to do with Hall's condensers, he said, "No, but he knew the engineer of the *Seahorse*, Hull and Hamburgh steamer, and that he had told him that they often obtained a vacuum of 32 inches!!" "Scalpel" won't be surprised at this; he expects 34 or 36 some day! but I would recommend Mr. Hall to apply to the engineer of the *Seahorse* immediately for a certificate! Besides, such a "manager" deserves promotion! Can't he be got into the President? "Steam is yet in its infancy!"

BROWN'S PATENT UNIVERSAL COOKING APPARATUS AND AUTOMATON ROASTING JACK.

Fig. 1.

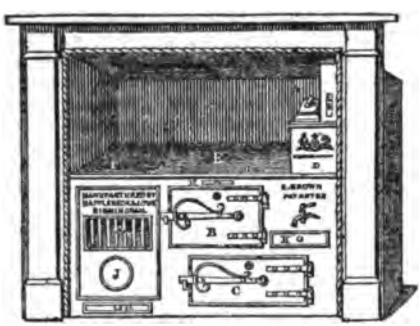


Fig. 2.

The cooking apparatus represented in the prefixed engraving, seems to have been designed with a view to remedy the inconveniences and annoyances, by which ordinary kitchen ranges and their appurtenances are particularly distinguished. It is well known that many of the best stoves are rendered useless, and become perfect nuisances, from defective setting; but here we are presented with a stove that requires *no setting at all.* From the large size of the opening in the throats of most kitchen chimnies, they are subject more or less to smoke; while in the present stove this opening is so much contracted as to become a certain preventive of smoking. The arrangement adopted by the patentee, will be easily understood by a reference to the prefixed engravings, representing a view of the stove and its excellent appendage, the Automaton Roasting Jack, both of which are manufactured by Messrs. Mapplebeck and Lowe, of Birmingham, for the inventor and patentee, Mr. Brown.

Fig. 1, A, is the receptacle for the fire, to be open or closed at pleasure: the fire being lighted in the usual way with paper, wood, coals, &c. Any kind of coal or coke may be used in this stove, but if stone coal can be easily obtained, that, and common house coal, in equal proportions, is recommended by the patentee. B, is an oven; C, a hot closet; D, the boiler; E, a hot plate applicable to boiling, stewing, frying, &c., and to heating of irons; F, is an opening to the

fire-place, through which the fuel is supplied, and over which, a kettle or other vessel wanted to boil quickly may be placed; the gridiron being placed here, it forms an admirable broiling stove; G is a slide for admitting air to supply the fire, and thereby regulating the rate of combustion; H H are drawers beneath the boiler and over the oven, for cleaning the flues; these, as also that leading to the chimney L, should be cleansed once a week, which can always be done in five minutes; J, is an opening for receiving the air-tube of the roasting-jack, and when not in use is closed with an iron cover.

Fig. 2, K is a screen containing the jack; when roasting is to be performed, the tube J is to be inserted in the corresponding opening beneath the fire-place, when a current of air will be continually drawn through, which striking on a vane-wheel placed therein will give motion to the vertical shaft and fly-wheel, from which the joints may be suspended.

The stove and jack, form together an apparatus so exceedingly simple in all its arrangements, that no person can by any blunder mis-use or derange it. Being all in one, like a chest of drawers, it only requires to be put into its place, keeping the back of the range a few inches from the wall, and making all round the front as air-tight as possible.

With simplicity and facility of operation (being in action in a few minutes) it combines in a striking degree the essentials of comfort, cleanliness, and safety, and is said to effect a saving of from 50 to 70 per cent. in fuel.

ON THE MANUFACTURE OF FLINT GLASS.—BY APSLEY PELLATT, ASSOC. INST. C.E.

Flint glass, called by the French "cristal," from its resemblance to real crystal, is composed of silex (whence the English name), to which is added carbonate of potash and litharge, or red lead; to which latter material is owing, not only its great specific gravity, but its superior lustre, its ductility, and power of refraction.

It is necessary for optical purposes that flint glass should be perfectly free from striæ, otherwise the rays of light passing through it diverge and become distorted, and this defect is caused by the want of homogeneity in the melted mass, occasioned by the difficulty of perfectly fusing substances of such different density as the materials employed. The materials, being properly prepared, are thrown at intervals into a crucible of Stourbridge clay, which will hold about 1600 lbs. weight of glass when fused. The mouth of the crucible is then covered with a double stopper, but not luted, to permit the escape of the moisture remaining in the materials, as well as the carbonic acid gas and excess of oxygen. It requires from 50 to 60 hours application of a rapid, intense, and equal heat to effect the perfect fusion of the materials and to drive off the gas; during which time the unfused particles and excess of salts are skimmed off as they rise to the surface. The progress of fusion cannot be watched, nor can any mechanical means for blending the material during fusion be resorted to, lest the intensity of heat requisite for the production of a perfectly homogeneous glass should be diminished, the quality of the product being influenced by any inattention on the part of the fireman, as well as by the state of the atmosphere or of the wind. It has been ascertained that there is a certain point or crisis of fusion at which the melted metal must be kept to insure a glass fit for optical purposes, and even when that point be attained, and the crucible shall furnish proper glass during several hours, should there be such diminution of heat as to require the furnace to be closed, the remainder of the metal in the crucible becomes curdy and full of striæ, and thus unfit for use. It is the same with the glass made for the flat bore tubes for thermometers, which are never annealed, because the smoke of the annealing furnace would render the interior of the bore unfit for the reception of the mercury. These tubes will only bear the heat of the blow-pipe when they are made from a metal which has been produced under all the favourable circumstances before described. It is, therefore, to be inferred, that the most homogeneous and perfect flint glass can only be produced by exposure to an intense and equable degree of heat, and that any excess or diminution of that heat is injurious to its quality.

The English method of manufacturing the flint *plate* for optical purposes is thus described. About 7 lbs. weight of the metal is taken in a ladle of a conical shape from the pot at the proper point of fusion, and then blown into a hollow cylinder, cut open, and flattened into a sheet of glass of about 14 inches by 20, and varying in thickness from $\frac{3}{8}$ths to $\frac{1}{4}$th of an inch. This plate is afterwards annealed, and in this state goes into the hands of the optician, who cuts and grinds it into the requisite form. When a glass furnace is about to be put out, whole

pots of metal are sometimes suffered to remain in it, and cool gradually. The crucibles being destroyed, pieces of glass may be cloven from the mass of metal, softened by heat, and made to assume the requisite form, and then ground. It is believed that the excellent glasses made by Frauenhoffer, and other manufacturers on the continent, are produced by some such means. On attempting to cut glass ware, it is easily perceived if it be sufficiently annealed; if not, the ware is put into tepid water, which is heated, and kept at the boiling point during several hours; it is then suffered to become gradually cold. This method is more efficacious than re-annealing by the ordinary means. A piece of unannealed barometer tube of 40 inches in length being heated and quickly cooled, contracted only $\frac{1}{16}$th of an inch, whereas a similar piece, annealed by the usual means, contracted nearly $\frac{1}{8}$th of an inch. Unannealed flint glass, being heated and suddenly cooled in water, exhibits the appearance of a mass of crystals; it is thence inferred that the process of annealing renders the glass more compact and solid; it thus becomes incapable of polarization.

Flint glass being remarkably elastic, has caused it to be used for chronometers. To prove its elasticity, a hollow ball of unannealed glass of 3 inches diameter, weighing about 16 ounces, was dropped, *when cold*, from a height of 7 feet upon a stone floor; it rebounded uninjured about 3½ feet, but broke on falling to the ground after the rebound. Similar balls, both at a *bright* and a *low red heat*, were dropped from the same height, and both broke immediately without any rebound; thus demonstrating that its elasticity only exists while cold. Glass being sometimes deteriorated in the process of reheating, not only in colour, but in its faculty of welding, by the sulphur existing in the coal or coke used in the furnace, this is prevented by occasionally throwing about a quart of cold water on the fire; the explosive vapour thus raised carries off the sulphureous gas.

The process of annealing has the remarkable property of carrying off from the glass the reddish tint imparted to it by by manganese; and in large masses, not only the reddish tint disappears, but the glass sometimes becomes green or blue, probably by the action of the sulphureous acid gas from the coke. The reddish tint will however return, and the greenish one disappear, should the annealed glass be afterwards heated or remelted. Should the pot crack during fusion, and the flame or smoke come in contact with the melted metal, a green tint and abundance of dense striæ will be the consequence. Such an accident can only be repaired, if the crack be accessible, by throwing cold water on the exuding metal, which thus becomes gradually cooled, and itself forms a lute, so as to enable the process of melting to be continued. Long experience has shown that the best fuel for melting glass in the furnaces is oven-burnt coke mixed with a small quantity of screened coal.

Mr. Pellatt illustrated the preceding paper by specimens of glass exhibiting peculiar effects of crystallization; among them were cylindrical solid pieces of flint glass, which, from being suddenly cooled by plunging them into water, had the interior entirely dislocated, and were merely held together by the exterior coating; portions of tubes showing the same effect; a portion of a vase of white glass dipped into blue glass of a greater density—in cooling, the interior white glass appeared to be crushed by the contraction of the exterior coating; a similar vase of white and blue glass of more equal density had cooled, and bore cutting without cracking; a mass of optical glass, exhibiting striæ, specks, and imperfections; which, together with the modes of manufacture, he explained.

In answer to several questions, Mr. Pellatt was not aware of any attempt having been made to cut the bulb of Prince Rupert's drops: he believed the peculiar property of the bursting of these drops or tears, on the end being broken, arose from a crack suddenly commencing and extending itself rapidly throughout the mass, causing the dislocation of the particles. Flint glass is seldom sufficiently fluid to make these drops; they are generally made from glass which does not contain lead.

Alluding to the use of plate glass in Nasmyth's Pneumatic Mirror, he observed that, owing to the absence of lead, plate glass was purer and more homogeneous than flint glass, and the equality of thickness produced by grinding and polishing enabled the curve caused by the pressure of the atmosphere to be very regular.—*Trans. Inst. Civ. Eng.*

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

ROBERT BEART, OF GODMANCHESTER, MILLER, *for improvements in apparatus for filtering fluids.* — Enrolment Office, August 8, 1840.

The patentee claims in the first instance, a mode of constructing filtering apparatus with two perforated or reticulated plates of metal, kept a short distance asunder by means of wires or metallic rods. The metal plates may be of zinc, tin, or any material not chemically acted upon by the fluids to be

filtered, and they may be soldered together, except in cases where the interior of the plates will require cleansing. The frame thus formed is covered with paper, or other suitable filtering material, which is retained in its place by an external hinge clamp, fastened by screws. An eduction pipe is placed in communication with the interior of the filtering frame or frames, so that no fluid can escape from the vessel in which the filtering apparatus is placed, without passing through it. The shape of the apparatus may be rectangular, circular, or square, to suit the vessel in which it is to be employed. The patentee claims secondly, the employment of suitable supporting and filtering materials sewed upon convenient frames, with an eduction pipe as before, in communication with the interior. And, thirdly, the mode of constructing filtering apparatus by means of two surfaces of drip-stone, the eduction pipe being placed in communication with the inside.

The patentee states that the great object of these inventions is to obtain portable filtering apparatuses for the army, so that by constructing a filter according to his second claim of two surfaces of the article known by the name of "moleskin," with a flexible water tight tube attached as an eduction pipe, a soldier may carry his filter in his hat. The "mode of using this apparatus" (we quote the specification verbatim) "by a soldier, or other person, is to drop the filtering apparatus into a pond or other water, and then by a sucking action obtain the water in a filtered state; and thus may soldiers, or other persons, obtain the water in a filtered state, without the use or aid of vessels."

Whatever may be the claims of this filter to novelty, there is doubtless not a little in the prescribed mode of using it. Only imagine a battalion of the household troops stationed along the Serpentine, and at word of command, doffing their hats! dipping their filters! and sucking away! Might not our brave fellows run some chance of being dubbed "the *sucking* brigade"? And would they not greatly prefer taking the chance of a few impurities in the water they drink, to being put through so ridiculous a course of discipline?

George Eugene Magnus, of Manchester, Merchant, *for certain improvements in Manufacturing, Polishing, and Finishing Slate; and in the application of the same to domestic and other useful purposes.*—Petty Bag Office, August 8, 1840.

The patentee seeing how extensive the use of slate is now becoming, and its daily application to all kinds of domestic purposes, has endeavoured to secure to himself the use of it for the purposes of making the frames and legs of billiard and other tables, baths, mangles, corn-bins, liquor-cocks, &c. &c., which application constitutes his first claim. His second, is for a peculiar method of polishing (*i. e.*, varnishing and polishing) the slate so as to equal in appearance the best finished marble. This varnish is composed of 7 lbs. of linseed oil; 1 lb. of amber, ground fine; 3 lbs. of spirits of tar; and 1 lb. of asphaltum. These ingredients being melted together are to be laid on the slate with a brush; after being exposed to a heat of 200 degrees or more, it is left to get cool and hard, and then polished with pumice and rotten stone, like other varnished articles.

We fancy the first claim will be difficult to establish, and that many varnishes equal to, or better than that herein described, may easily be composed.

David Napier, of York Road, Lambeth, Engineer, *for improvements in the manufacture of projectiles.* — Enrolment Office, August 12, 1840.

These improvements are two in number, but both apply exclusively to leaden balls, or projectiles made by compression in contradistinction to casting.

The first, refers particularly to bullets for guns, pistols, and rifles, where great accuracy and perfection is required; the second, refers to the formation of small shots, where equal accuracy is not necessary. The machinery for making bullets, consists of two sliding plungers, placed horizontally and opposite to each other, each carrying a hemispherical die, the meeting and closing of which, give a perfectly spherical form to any substance compressed between them. In the centre of these plungers there are two sliding-plugs, which, in the retrocession of the plungers, are urged forward by a spring placed behind them, and drive out the compressed ball. An alternating motion backwards and forwards, is given simultaneously by knee joints connected with a crank-shaft and fly-wheel. Strips of lead having projections, prepared either by rolling or casting, are supplied to the machine, the continuous pressing of which converts the projecting pieces of lead into perfect spheres, held together by a thin film or strip of lead. These strips are taken to a small hemispherical punch, working vertically into a circular bed of the size of the balls; by bringing down this punch by means of a foot treddle, the balls are cut out, fall through the bed, and roll down a trough into a proper receptacle.

The second improvement consists in the employment of four wheels or rollers, on the outside of a frame, connected together by suitable gearing. Two of these rollers have hemispherical cavities sunk in their peripheries, the meeting of which gives a spherical

form to any substances squeezed between them. The third roller has a series of holes upon its periphery, corresponding in size with the before-mentioned cavities, and a groove turned out on its face so as to make an opening to the bottom of these holes. The fourth roller, opposed to this, has a plain surface. Lead in the form of rods being supplied to this machine, it is conducted by proper guides between the first pair of rollers, by which it becomes converted into a riband, studded with a number of spheres; other guides carry it between the second pair of rollers, when the shots are forced through the holes in the third roller, and fall from the machine in a finished state—the riband or film of lead passing off the machine pierced with a number of circular holes from which the shots have been extracted.

PATON'S "FLOWERS OF PENMANSHIP."

We have been favoured with a letter of animadversion from Mr. Paton on our notice of this work, which, but that usage and propriety alike forbid the practice of allowing authors to reply upon their critics, we should have pleasure in inserting. It may, however, equally serve Mr. Paton's purpose, to state briefly that he entirely disavows that self-laudation which we thought ourselves justified, by the language of his preface, in imputing to him; and earnestly desires that all who may have any doubt of his modesty being equal to his merits, will read the said preface itself—as we too hope every one will do who may think it worth his while to ascertain whether we were right or wrong in our judgment on this point.

After all, Mr. Paton does but deny the *saying* of himself the many fine things ascribed to him in our notice, not that he *thinks* himself eminently deserving of them all. As indeed why should he? There is the high authority of Lavater for affirming that the only certain characteristic of "a man of genius" is that he can do what nobody else, or only a very few beside, can. Now Mr. Paton prides himself, and most justly, on being the first penman of his day; he can write (and *flourish* too) as no other penman of his time can; therefore is Mr. Paton indubitably of the "few and far between" order "a man of genius," "a distinguished character," &c. &c. *Q. E. D.*

NOTES AND NOTICES.

Atlantic Steam Navigation.—The *Britannia*, the first of the Royal Mail steamers between Liverpool, Halifax, and Boston, left Boston on her first return voyage on the 1st August, and Halifax on the 4th, and arrived at Liverpool on Friday, the 14th—being the quickest passage ever made between America and Europe.

Draining of the Haarlem Lake.—The body of water in this inland sea, the draining of which has been long a favourite object of speculation with our Dutch neighbours, is estimated at 770,000,000 cubic feet. M. Dietz, a native engineer of some eminence, has invented a machine with which he proposes to effect this in less than three years, for 797,000 florins, or £66,476 English.

Aurora Borealis in the Far South.—On the night of the 26th May, 1840, there was a remarkable meteoric appearance at Caraccas, which, though not entirely corresponding with the descriptions given by naturalists of the aurora borealis, must nevertheless be regarded as such, since it is impossible to compare it with any other known phenomenon. At 10 o'clock p.m. a luminous band, stretching towards the east, and broader at the opposite quarter, girded the horizon. The most brilliant portion became occasionally agitated, forming apparently a parabola, the vertex of which, only a little above the horizon, departed 76 degrees from the magnetic meridian towards the west—a circumstance which has the more claim to attention, inasmuch as in the aurora borealis hitherto known, the point of convergence of the numerous rays is precisely that to which a magnetized needle, freely suspended by its centre of gravity, points. An opaque column, which appeared and disappeared with the undulations of the meteor, or whatever might be the nature of that ocean of flame, glided rapidly, now to the left, now to the right, but without ever transpassing the horns of the curve. If the light of the meteor sometimes became so faint as to induce a belief that it was about to disappear, it would suddenly revive in all its brilliancy. Twice it assumed a delicate purple tint, which also happens when electricity is propagated through a highly rarefied medium. Hence the great elevation of the phenomenon may be conjectured. Half-an-hour before its final disappearance five brilliant exhalations, which issued from the vertex of the parabola, with branches whirling upwards, imparted an astonishing character to the spectacle, and added to its splendour. At half-past 12 complete obscurity prevailed.—*From the Polytech. Journal, abridged.*

Getting up the Steam.—Lieutenant Janvier, of the French navy, is said to have discovered a means of getting up the steam of engines with such rapidity, that in ten minutes from the first lighting of the fire, and although the water in the boiler be quite cold, a vessel may be set in motion. This is, it is added, to be accomplished without any additional apparatus, and at very little expense.

A Newly-Invented Planing Machine.—On visiting the Polytechnic Exhibition, Newcastle, a few days ago, we were much amused at witnessing the operations of what appeared to be a little model of a planing machine on a new plan, and we followed its backward and forward motion with a great deal of interest; when, after a very short space of time, we were not a little surprised at the precision and the quantity of work performed; and we discovered by a brass plate, that, instead of being merely a model, it was, in fact, a new working planing machine, recently introduced into the mechanical work-shop by a Mr. John Roberts, of Manchester. It is so simple in its construction, and so portable in its dimensions, that it may be laid on the vice-bench, and set to work either by a motion from a steam-engine or by hand, and so useful that one man with it can do the work of three men at the vice. The principal novelties in the invention are—the tool, which cuts both ways—and the extreme facility with which anything to be planed may be fixed in the machine. It may very appropriately be termed a self-acting mechanic, and does credit to the mechanical talents of the ingenious inventor, Mr. Roberts.—*Port of Tyne Pilot.*

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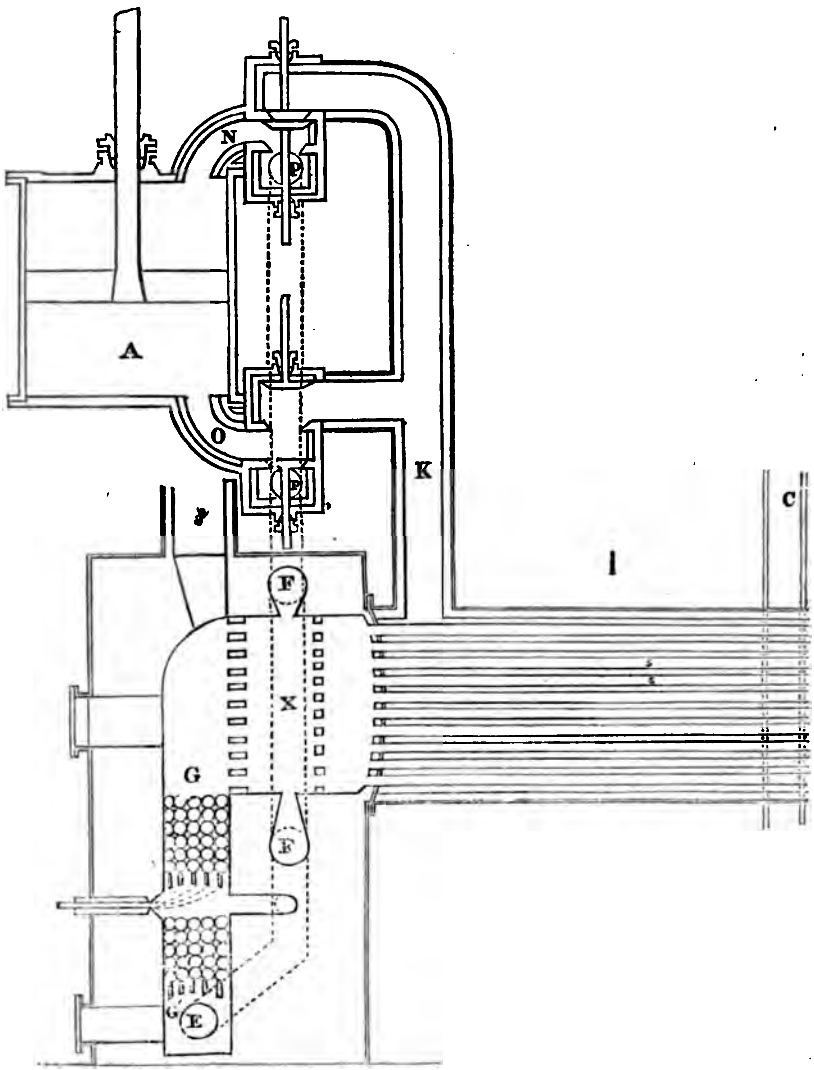
CRUCKSHANKS' LIQUID FUEL AIR ENGINE.



MR. CRUCKSHANKS' IMPROVED METHODS OF APPLYING THE COMBUSTION OF INFLAMMABLE SUBSTANCES TO THE PRODUCTION AND COMMUNICATION OF HEAT AND LIGHT.

Specification Enrolled January 8, 1840.

The improvements which are the subject of this patent consist in the employment of combustible substances in a *liquid* or gaseous form in conjunction with *incombustible* solid bodies for the production of heat and light.

The combustible substances referred to by the patentee as reduceable to a liquid or gaseous form, are fixed and volatile oils, resins, tar and other bitumens, and all similar substances which either exist naturally in a fluid state, or may be liquified by heat.

The heat produced by oils and other inflammable liquids is already advantageously applied to chemical and other purposes on a small scale, and tar, resin and oil have been used in conjunction with coal and coke in furnaces, but no method has hitherto been made known of using liquid fuel alone on a large scale. At length, however, this has been successfully accomplished by the method about to be described, by which liquid fuel of any kind, but more especially the tar distilled from coal may be directly applied, and with powerful effect, to the generation of steam and to many other processes usually conducted in reverberatory and other furnaces with solid fuel.

Mr. Cruckshanks makes use of a furnace divided into three distinct compartments. First: there is a compartment at bottom for burning coal or any other solid fuel after the usual manner, which is covered in by a ribbed dome of fire bricks, with open spaces of two or three inches between each pair of ribs. Secondly: there is a compartment immediately above the dome about twice the height of the preceding, which is filled with balls of baked fire-clay, or any other incombustible substance, to about three-fourths of its entire height, and also covered in with an open dome of fire-bricks. And, thirdly, there is a compartment of the same size of the second, and filled with balls of the same incombustible description.

Let us now suppose a furnace of this description to be substituted for the ordinary furnace of a steam-engine and boiler; let us suppose further, that there is a blower attached to the apparatus for the purpose of accelerating the process of combustion, a syringe for injecting into the furnace, tar or other liquid fuel, at the space left empty between the top of the fire-balls in the second compartment and the bottom of the second dome (both the blower and the syringe being worked by the engine) and passages left at convenient places for the return of streams of heated air into the furnace.

The mode of proceeding is then as follows:—A fire of common or solid fuel is made and kept up in the first or undermost compartment until the balls in the second have acquired a dull red heat, when some liquid fuel is slowly injected by the syringe and the blowing machine set to work, (by hand or any other convenient means) whereby the whole interior of the furnace is soon heated to a degree sufficient for the combustion of any additional quantity of tar or other liquid fuel that may be introduced. The solid fuel fire being now no longer required is put out, and access to it closed. The syringe is then kept supplied with fuel, and as soon as steam enough has been generated to set the engine in motion, the fan is connected with a band passing over a drum on the shaft, and afterwards worked by it. A portion of the liquid fuel corresponding to the volume of steam required being injected at each stroke of the engine is at once converted almost entirely into vapour, while any solid carbon that remains undergoes combustion as charcoal would do in a common furnace.

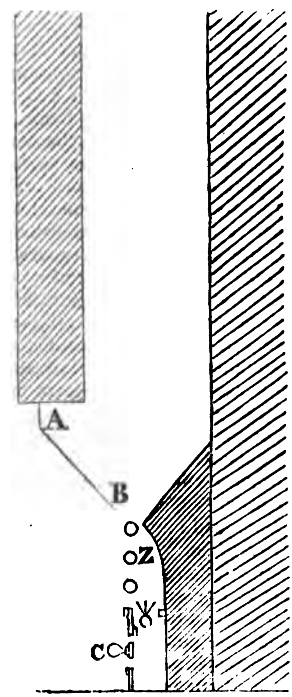
If the expansion of air, instead of the generation of steam be the motive power desired to be brought into play, this new method of generating the heat requisite for the purpose will be found equally available. In most, if not all of the air engines hitherto constructed, the air has been passed through coal or other solid fuel; but it has been universally found that the ashes carried forward by the rapid current, soon destroyed the cylinder and piston. An air engine fed with liquid fuel, must, however, be wholly free from this defects. Mr. Cruckshanks gives in his specification two plans of

such an engine; but we shall confine ourselves to describing what we think the most ingenious and best of the two, a sectional view of which (fig. 1) is given in our front page.

"I is a reservoir of condensed air, which is heated by the hot air and vapour from the furnace passing through the tubes S, S, in the same manner that steam is generated in a locomotive boiler. The condensed hot air from I passes by the pipe K and the passages N, O, to the working cylinder A, and at each stroke of the piston a part of the waste air which escapes by the pipe Q, enters the chamber X, by branch pipes at F F, and the remaining portion is conveyed by another branch opening at E, into the chamber G. These pipes are furnished with registers, by which the proportion of air that passes through each may be governed. The quantity of liquid fuel and the air for its combustion are to be so regulated, that the *mass* of hot air and vapour in the chamber X, shall have the temperature required to give the expansive force desired to the air in the reservoir I in passing through the tubes, S, S, to the chimney C. This adjustment having been made at the commencement of the operation, as the supply of fuel injected by the syringe is governed by the motion of the engine, and keeps pace with it, the *same* temperature, and consequently the same expansive force in the reservoir I, will be consequently maintained without further attention."

It will readily occur that a similar method of employing incombustible substances in conjunction with inflammable gas or vapour, may be employed to heat apartments and buildings in general, to roast meat, and for other domestic purposes to which the radiant heat of a common coal fire is usually employed. An exemplification of this is given in fig. 2. Z represents a grate to be filled with balls of fire-clay, or other incombustible substance, among which jets of inflammable gas or vapour are introduced from below. The incombustible matter becoming heated to redness by the combustion of the gas or vapour, has the appearance and answers the purpose of a common coal fire. The balls should be made hollow and very thin, that they may be the more readily heated. They may be even formed of wire-gauze (platina gauze Mr. Cruckshanks thinks would answer admirably) or any thin metal, covered in the case of oxidizable metals with any lute or vitreous matter that will protect them from the atmosphere. It is deemed advantageous to give the back of the grate a curve outwards, (as shown in the figure) and the depth, from back to front, may be much less than when the grate is intended for burning coal. The front bars may be dispensed with as the contents of the grate may be cemented or otherwise supported without them. When the draught of the chimney is not sufficient, any of the plans adopted with grates for coals may be used to increase it, as for instance, that shown in the fig.

Fig. 2.



where the space above the grate is closed in by a plate A, leaving only a narrow opening B immediately above the fire. The passage above the fire should be furnished with a damper, and the supply of air below the grate regulated by a register. Mr. C. thinks this is best done by closing the front of the ash-pit and placing a register as shown at C.

Hitherto we have spoken of Mr. Cruckshanks' newly invented processes as applicable to the production of heat alone, but it remains to be shown how they may be rendered available for *lighting* purposes.

Sir Humphry Davy it was who first established the fact, that the luminous property of common flame is an effect owing entirely to the intense ignition of particles of solid carbon; and also that other fact, that by placing any solid incombustible body in flame which is scarcely luminous, such as that of hydrogen gas, that body on acquiring a high temperature will equally emit a powerful light. A simple experiment will serve to illustrate these interesting truths. If an opaque body be held between the eye and the flame of a common candle, so as to screen the luminous portion of it, an outer flame of a delicate blue colour will perceived, and if a fine platina wire be held in this outer flame, which is itself scarcely luminous, the wire will emit a dazzling light. The intensity of the light diminishes as the wire is advanced further into the flame, the maximum effect being produced when it is just within the line that separates the outer flame from the surrounding atmosphere, where the greatest heat resides.

Now in order to obtain light from flame that is scarcely luminous, as that of gas obtained by the decomposition of water by means of carbon, or to increase the light of flame rich in carbon as that of coal or oil gas, Mr. Cruckshanks constructs a cage of fine platina wire-gauze or network of the form of the flame, and just so much smaller than the flame as to be immersed in the outer or hottest part thereof, and he places it in that position. When the flame presents two surfaces to the air, as in that of the argand burner, he adapts a cylinder of wire-gauze to the outer part of the flame, and another cylinder to the inner part. When the flame is rich in carbon it is sufficient to make the metallic tissue only half the height of the flame, as it is in the lower part of the flame that there is most heat and least light.

In order still further to increase the light, Mr. Cruckshanks proposes to avail himself of the property possessed by lime and other earths, of emitting a purer and more powerful light than other bodies at the same temperature, by coating the platina wire with a thin covering of such earth. Lime from its cheapness is to be preferred for this purpose, and it need not be in a caustic state, as it is sufficient to dip the net-work in a mixture of chalk and water and dry it, and when exposed to the heat of the flame the carbonic acid will be driven off. If the earth be in a caustic state it should be mixed with oil of turpentine or other fluid that does not contain water. This coating not only increases the light but adds to the strength of the wire-work.

The thickness of the wire will depend on the size of the flame and the intensity of the heat, but it may be taken as a general rule that it cannot be too small, provided the heat of the flame be not sufficient to fuse it or change the form of the tissue. In most cases wire about the two hundredth part of an inch in diameter will fulfil this condition. The size of the meshes or interstices will likewise vary with different flames, as well as the thickness of the wire, but the average size may be about one-twentieth of an inch. If the flame be conical the apertures will evidently vary in size.

Having now presented our readers with the substance of the various improved processes which form the subject of the present patent, we may say generally of them, that they appear to us to be conceived in an exceedingly philosophical spirit, are very fully and clearly described, and bear the promise of great practicability and usefulness.

STEAM NAVIGATION.—NECESSITY OF FURTHER PROTECTION FOR HUMAN LIFE.

Sir,—In looking through the extracts from the recent pamphlet on the "Prospects of Steam Navigation," given in the *Mech. Mag.* a week or two ago, it appeared to me that the writer's arguments were by no means borne out by the facts adduced, and even that the data supplied by himself for their support were quite sufficient for their confutation. With a great affectation of candour, he professes to give a comparative view of the loss of life and property by sailing-vessels and by steamers, and to draw from the result a triumphant inference that the labours of the Government Commis-

sioners for inquiring into steam-boat accidents were totally uncalled for. The danger to property might be put out of the question altogether, as the grand object of the commission was to point out a remedy, if possible, for the danger to *human life* which sad experience seemed to show had been hitherto attendant on steam navigation; and, accordingly, the pamphleteer professes to make it his main object to show the great "comparative security" of steamers over sailing-vessels in this respect as well as in the other. But how has he done this?

In the first place he makes a quotation from a Parliamentary Report on Shipwrecks in general, to the effect that "a thousand human lives are annually lost by shipwreck;" and he then goes on at once to observe, as though this fact settled the matter beyond all contest, "this is a fearful statement, in comparison with which the casualties enumerated in the report of Messrs. Parkes and Pringle sink into insignificance; at all events, even the most sceptical, when they compare the two accounts together, must feel satisfied of the great security of steam navigation." If this were the case, why did not our author go on to make the comparison, *with regard to life as well as to property*? He omits to do this, but yet very quietly takes it for granted, that the superior safety of steaming has been proved beyond dispute. What if the statements furnished by himself, when examined, prove the direct reverse?

During the twenty-two years, from 1817 to 1838, according to the pamphlet, 629 persons lost their lives by steam accidents, including those run down in boats on the Thames; according to the Report, the gross number of persons actually killed on board steamers, in the same period, was 576. Either of these amounts seems small compared with the thousand per annum due to sailing-vessels; and upon this *appearance* only the author of the pamphlet seems to have placed his sole reliance. But, unfortunately for himself, he happens to have informed us that the average number of sailing-vessels in each of the years "the Shipwreck Report" refers to, ranged to upwards of twenty-five thousand; and thus supplied us with a key wherewith to pluck out the heart of the mystery. It would be all very well to notice the astounding fact, (I wonder the opportunity was neglected) that, in 1817 for instance, while somewhere about a thousand lives were lost to the country in sailing-vessels, nine only was the sum total on board the whole body of our steamers;—but if it should once be observed that the former mustered upwards of twenty thousand, and the latter neither more nor less than fourteen (not fourteen *thousand*) the conclusive bearing of the fact might very probably be questioned.

It is hardly fair, however, to select any one year for examination, although that is the course pursued in the pamphlet for testing the comparative security of property;—the year he selects being one peculiarly fertile in sailing disasters, and equally barren in those of steaming. Let us, on the contrary, take the whole period of twenty-two years; during that time, as is shown by an extract from the report given in the pamphlet itself, the aggregate number of steamers afloat (14 only in the first year and 766 in the last,) amounted to somewhat less than six thousand. The average annual loss of life on board sailing-vessels, we find on the same authority, is one to every twenty-five ships. What, therefore, would have been the destruction of life in the time on board an equal number of such vessels? (6000 ÷ 25 =). Two hundred and forty. And what was the actual loss on board that number of STEAMERS? — Why, according to the lowest estimate, *five hundred and seventy-six!*—More than two to one, and that deduced from the data supplied to demonstrate the great "comparative security" of steam, and, by consequence, the folly of attempting any improvement in the existing state of things! In the words of the pamphlet, (a little altered) "Can any stronger argument be required to show the comparative (in) security of steam vessels?"

The facts brought to light by Messrs. Parkes and Pringle, do indeed exhibit a melancholy picture, especially when it is borne in mind that almost the whole of the vessels to which so frightful a waste of human life is due, being mere river craft and coasters, and not exposed to half the perils of the sailing-vessels, on board of which the occurrence of fatal accidents is so much less frequent. Considering the usual employment of steam-

ers, most of them only used in the finest parts of the year, always under the eye of their owners, and within reach of the best assistance—to say nothing of the facilities for escape from danger afforded by their powerful machinery,—it might certainly be predicated that fatal accidents on board of them would be "few and far between." Enquiry has demonstrated the reverse; all these advantages have been neutralized by the cupidity and recklessness of some of the parties concerned; the public indignation has naturally been aroused as the news of successive disasters reached the ear; and yet, in the very teeth of fact, we now find a writer hardy enough to assert, in the midst of all this, that no inquiry was called for, and that "common justice demands the admission," that "the Companies have not been negligent of the duties imposed upon them by the responsibility of their position." *Proh pudor!*

That individual must indeed have been reduced to desperation, who could endeavour to bolster up his theory of "comparative security" by producing examples of the shipwreck of sailing vessels trading, not like a vast number of the steamers figuring in the list, to Chelsea Reach one way, and Greenwich Pier another, but to such rather more distant points as Quebec, New South Wales, Cape Breton, and Van Diemen's Land. What possible bearing could these misfortunes have upon the question? What light can they be expected to show upon the comparative security of steamers, when not one single steamer has ever yet made the same voyage as either of the vessels cited? Judging, indeed, from past experience, it may be anticipated that, when steam navigation shall have so far extended itself, the increased loss of life will be enormous, unless means be taken to remedy a state of things under which our mere summer home-going steamers display a fatality more than double that attending our sailing-vessels, which go to all parts of the world, at all seasons of the year.

The pamphleteer labours hard to make us believe that the recommendations of Messrs. Parkes and Pringle are unnecessary, if not impracticable; and the arguments he brings forward for this purpose referring to the superior effectiveness of self-interest in promoting the proper construction of vessels and engines, over the interference of authority, would be all very well were they not invalidated by stubborn facts. It is notorious that the most appalling accidents that have occurred to steamers (the *Rothsay Castle* is a case terribly in point) have taken place on board vessels totally and miserably unseaworthy; and it is quite as notorious that the engines of most steamers of the speculative class (which often present the most taking outside show) are generally in an equally unsafe condition. Our pamphleteer himself admits that such is the case, and yet he contends that no interference is necessary, and that "a motive (self-interest) is already at work, which obtains security much more effectually." That motive being one, which, (not to mention other instances) was not strong enough to prevent the sending of the *Rothsay Castle* to sea in a state almost insuring the destruction of all on board, in the event of rough weather,—and which actually *did* lead to the loss of a hundred and nineteen valuable lives, along with the crazy and worn-out vessel. The pamphlet does indeed, at last reluctantly admit that some superintendence might be usefully exercised over the ship alone, but not over the machinery. Why not? Is *that* always so safe? Witness the bursting of the *Victoria* boilers, twice within a month or two; witness the numerous (and increasing) accidents of the same kind which crowd the pages of the report. It is hardly possible to conceive a clearer case for interposition than is presented by the one fact, that these explosions have always occurred to the boilers produced by manufacturers *of a certain class*, whose practice has nevertheless been so little known to the public, that they have trusted themselves on board vessels fitted with their engines with as much confidence as on board of any others. In this matter the public, here, as in America, are evidently incapable of watching over their own safety; and it therefore becomes the duty of the legislature to interfere. So general is the feeling to this effect, that no persons appear to entertain any objections to the interference proposed (to the examination of engines, granting of licenses, &c.) with the exception of *the manufacturers of the inefficient engines*,—AND the author

of the pamphlet.* That their opposition should not succeed is doubly desirable from the present state of the law and its administration, under which, when a fatal case *does* occur, all parties concerned continue to escape from personal punishment, by the inapplicability of existing laws to a state of things never dreamed of by their original framers; and from pecuniary mulcture, by the quirks and quibbles always at the service of a wealthy company. The complaints in the pamphlet as to the anti-steam animus of our courts of justice must surely be allowed to be ridiculously ill-founded, when it is remembered that in every case where a coroner's jury have inflicted a heavy deodand, the proceedings have been quashed (on mere technical points of no importance) in the superior courts; and also that the engineer whose boilers by their bursting have caused the deaths of more than *one-third* of the persons returned as having "perished by similar calamities," since the first introduction of steam navigation in this country, is not only at large, but has never suffered one hour's imprisonment, nor a fine of one farthing, in the whole term of his destructive career! It is ridiculous to suppose for a moment that the Government Commissioners any more than the courts of justice, are animated by a wish to stop the progress of steam. No men and no measures can do that; but least of all will its march be arrested by regulations which will remove, instead of "casting," a "stigma," on enterprises of public utility, and tend to rescue "a most important branch of our great national marine," from the hands of an "inferior" and irresponsible class of men, in which circumstances have hitherto too often placed it. Salutary control, instead of deterring "the most respectable among capitalists, and the most eminent among scientific men," from entering the arena, would encourage them to do so, by protecting them from the unfair, because reckless, competition of unprincipled adventurers, who, under the present (no) system, by the disasters they cause to be connected in the public mind with the very name of Steam-Navigation, are the means of casting a slur on *all* alike who are engaged in its promotion.

And I remain, Sir,
Yours most respectfully,
H.

London, August 18, 1840.

* Our correspondent is misinformed on this point. The opposition, includes to our knowledge, nearly all the eminent engine makers of the day, and many, of whose engines no complaint has ever been made. ED. M. M.

LONG AND SHORT STROKE STEAM-ENGINES.

New York, August 1, 1840.

Sir,—Having seen in your valuable journal of March 14, 1840, (No. 866,) a paper by an American mechanic on long and short stroke steam engines, I would beg to suggest a few facts on the subject, which may tend to remove his doubts as to the cause why the long stroke is preferred on this side of the Atlantic.

In the first place, it will be well, to take into consideration the action of some long stroke engine. I shall therefore select the engines of the *North America*—as that boat is one of the last built, and fastest on these waters. The dimensions of her engines are as follows: Diameter of cylinder 42 inches; stroke 11 feet; pressure on boiler 50 lbs.; pressure on piston 29.82; barometer 28 inches. Cut off ½ stroke. Strokes per minute 44; revolutions of wheel 22. Distance performed each voyage from New York to Albany 145 miles; time of voyage nine hours; miles per hour, including six stoppages 16.11. Consumption of fuel (Anthracite coal) 22,000 lbs. According then to the rule laid down in *Templeton's Engineers' Common Place Book*, the power will be

$$\frac{42^2 \times .7854 \times 29.82 + 5.75 \times 484}{33000} = 866.4$$

horse power—and the quantity of coal consumed per horse power per hour

$$\frac{22000 \div 9}{866.4} = 2.8 \text{ lbs. of coal.}$$

Having thus shown what this engine is doing, I would call attention to the following facts: In the first place, then, the benefit of a long stroke consists in allowing the steam to expand more freely and to flow at a greater velocity, not subjecting it to so many stops and turns as in the short stroke, and thus obtaining the greatest amount of valuable effect from the least quantity of steam. In the next place, by using high steam, smaller boil-

ers are required, and a very considerable saving of fuel effected—amounting in this case to nearly one quarter, and generally to one half the quantity required in low pressure condensing engines even of the most improved construction. The dimensions and position of the valves must also be considered. Those used are the common poppet valves, and they are opened by means of eccentrics and lifters. The very increase of velocity attainable in a long stroke, is alone of sufficient importance to account for the preference given to it. The steam in traversing a distance of 484 feet has only 44 obstructions; whereas, in a 5 foot stroke engine it would have 96. Now, inasmuch as at every stroke there is a decided stoppage in the flow, the fewer obstructions that occur in a certain distance the better; hence it is obvious, that the fewer impediments the current of steam may meet with, the greater will be the effect produced by that current, and the greater the velocity attainable by the piston. Again, the use of high steam has a certain mechanical advantage, giving a more lively action to the piston, and coming upon it with its full force—of course, where it is most required. It is true, this advantage is common to low pressure engines, but the action is decidedly more beneficial in the high steam than in the low steam engines. Moreover, the machine, according to this construction, produces a greater effect than any short stroke engines yet manufactured. The single engine of the *North America* requires only 2.8 lbs. of coal per horse power per hour; whereas, the lowest average of the short stroke and low pressure steam engines is 8 lbs.

Nor are the performances I have here cited of merely an occasional description, but of every day occurrence—the *North America* steaming constantly between here and Albany, leaving New York every other morning, and returning on the intermediate day from Albany.

Let me in conclusion add, that if the long stroke engines are not more economical, and otherwise better adapted for the purpose to which they are applied, we Yankees must be more "tarnation" fools than we are commonly reckoned to be, not to recur to, or rather adopt the short stroke.

Yours,

P. R. H.

THE "ECLIPSE" IRON STEAM BOAT.

SIR,—The Diamond Company some time ago offered to run their boat, the *Ruby*, against any vessel afloat, but although they assumed that the *Ruby* was the fastest steamer in Europe, they yet carefully abstained from naming her speed. Circumstances last evening afforded me an opportunity of discovering this; as the *Eclipse* iron steamer came past the town pier, Gravesend, just as the *Ruby* had started from it on her passage to London. Those of your readers who do not know the *Eclipse*, and have heard so much of the speed of the *Ruby*, would have been a good deal surprized had they witnessed the style in which the iron boat went away, "hand over hand," from this *most brilliant* "*Ruby*." Both boats left Gravesend at three minutes past six, the *Eclipse* (with 200 passengers on board) leaving the *Ruby* (with 150 passengers) the more astern the further she went, until the former arrived at Blackwall Pier, which place she reached at sixteen minutes past seven, having just been one hour and thirteen minutes from Gravesend. The *Ruby* passed the same place exactly at half-past seven, being thus beaten fourteen minutes by the iron boat. Assuming the distance to be 22 miles, and it is not less, the speed of the *Eclipse* was rather more than 18 miles per hour, and that of the *Ruby* 15½ miles per hour, the tide running in their favour from two to three miles per hour.

Much has been said about the *Eclipse* being worked by high-pressure engines, but this is incorrect, as she has a condenser *the whole length and breadth of the bottom of the vessel.* She is propelled by *one* engine, working vertically, the crank being placed immediately over the cylinder; and so far as I could see, she is as safe and strong as any vessel on the river; indeed, she has less vibration than any boat I was ever in. From what I could learn while on board, her cylinder is 54½ inches diameter, and length of stroke 4 feet; her paddle wheels are 16½ feet diameter, and 9 feet wide, the floats being 15 inches deep, and immersed in the water 2 feet. She has four boilers, two of which are placed before, and two abaft of the engine—an arrangement which requires her to have two funnels, and which, from the novelty of its appearance, coupled with the great

speed of the boat, has doubtless caused her to be looked upon with suspicion by the timid. The *Eclipse* is, 156 feet long, and 19 feet beam; and draws, when loaded with fuel, 5 feet of water.

Having myself been somewhat curious to learn the relative speed of the *Ruby* and the "*two-funnel boat*" (as she is called on the river), and knowing that many others are desirous to obtain information respecting it, I forward the foregoing statement for the perusal of your readers,*

And remain, sir,
Your obedient servant,
A SUBSCRIBER.

Poplar, August 25th, 1840.

SAILING AND STEAMING VESSELS.

It is now more than ten years ago since Messrs. Seaward, the eminent marine engine makers, in a pamphlet published by them on the application of steam power to East India navigation,† proposed "the plan of navigating ships to India, partly by wind and sails, and partly by steam power as an auxiliary," as being greatly preferable to any attempt to steam the whole way, for all purposes, saving only the conveyance of letters and passengers at the quickest possible rate of speed. Their reasons were briefly these. That a vessel thus doubly provided, by availing herself of the wind whenever favourable, and particularly of those friendly gales which prevail on the usual route to India by Madeira and the Cape of Good Hope, and are called from their excellent service to commerce, *the trade winds*, and by having recourse to steam power only when beset by calms or foul weather, might reckon with certainty on accomplishing the voyage from the Thames to Calcutta, at the rate of 220 miles a-day, or allowing 9 days for stoppages, in about 74 days in all, which is about two-thirds of the time commonly taken by the swiftest sailing vessels; that the quantity of fuel required for such a voyage would be less by one-half than would be required for a vessel steaming the whole way; and that consequently there would be so much more room for merchandize and passengers. Very cogent these reasons undoubtedly were, but it so happened that at the time the Messrs. Seaward wrote, neither the one plan nor the other of steaming to India, found sufficient favour in the sight of the public to be taken up by persons of adequate capital and enterprize; and so matters rested as to both, till the brilliant success of the late bold experiments to navigate by steam the broad Atlantic, demonstrated the perfect practicability of accomplishing the longest voyages by steam alone, but at the same time the utter hopelessness of carrying in such voyages more than a very slight addition to the machinery and fuel requisite for the purpose; and so turned men's minds to an earnest consideration of the means by which this new power might be made subservient to the carrying of heavy burdens, instead of usurping to so great an extent the space usually allotted to them. The time has now come for a better appreciation of the sensible suggestions on this head contained in the pamphlet of the Messrs. Seaward; and happy we are to find that not only are they appreciated as they deserve, but that those gentlemen have the good fortune to be themselves the parties employed to carry their own long cherished views into effect.

Two East Indiamen adapted both for sailing and steaming and of 1000 tons burthen each, called the *Vernon* and the *Earl of Hardwicke* have been built by the Messrs. Green of Blackwall, and fitted with auxiliary steam machinery by the Messrs. Seaward, and several more of the same description are or will soon be on the stocks.

The *Vernon* has already made one successful voyage out and home, and last week the *Earl of Hardwicke* left the Thames on her first trip to Bengal.

Of the voyage out of the *Vernon* we have not learnt any particulars; but we have been favoured with an account of her return voyage, which is in the highest degree satisfactory. She left Cal-

* The particulars furnished by our correspondent are confirmatory of those which we published in our 883rd Number; the additional information is peculiarly acceptable. The *Eclipse* is admitted on all hands to be a most surprising boat; she is at present running from Deptford to Margate in about four hours and a half, leaving Deptford and Blackwall at 9 A.M., and returning from Margate at 2 P.M.!—certainly the greatest rate of speed ever accomplished on British waters!—ED. M. M.

† "Observations on the Advantages and Possibility of successfully employing Steam Power in Navigating Ships between this Country and the East Indies.' London, 1829.'

cutta on the 3rd of March last, (the most unfavourable period of the year) experienced calms and light winds all the way down the Bay of Bengal, (where it is not uncommon for heavy sailing vessels to be driven by the monsoons at the rate of from 220 to 240 miles a day) and had to use her steam for eight days and nights consecutively,—stopped six days at the Cape, besides losing considerable time in going in and coming out—encountered throughout her whole course most indifferent weather—and yet made the British Channel in 96 days. If we deduct the time lost at the Cape, the actual time of sailing and steaming from Calcutta to Spithead, cannot be said to have exceeded 87 days—which though 13 days more than the Messrs. Seawards calculated upon in 1829, is nevertheless an abundantly remarkable performance. The distance from the Cape to Spithead was done in 42 days, and that we believe is the shortest voyage between these two points which is upon record.

The *Earl of Hardwicke*, left the Thames full of passengers, troops, and cargo, at noon on Monday the 10th instant, and, sailing and steaming, reached Spithead on Thursday the 13th, at 3·50 P.M., beating the *Wellington*, which she passed in the river on the 10th, and which is reputed to be the fastest sailing vessel out of the port of London, by at least 18 hours. On the 16th she took her final departure from England for Bengal, and is reported to be backed for high sums to reach her destination within the time originally contemplated, namely 74 days.

Messrs. Seaward, in their pamphlet of 1829, spoke of employing for vessels of the burthen of the *Vernon* and *Earl of Hardwicke*, engines of upwards of 160 horse power; but the steam power now actually adapted to these vessels is less than that by full four-fifths: a fact which ought not to be left out of sight judging of the first performance of the *Vernon*, or in any calculations which may be formed of the performances that are to follow. Engines of 160 horse power would probably have produced a speed of from 9 to 11 knots an hour, but the owners of this description of vessels are content to make sure of not less than five under all possible circumstances. Certainty of arrival within a given time, shorter than the shortest time usually occupied by sailing vessels, is we presume all they care for; and any advantage to be gained beyond that, by a sacrifice of freight a thing not to be thought of.

A brief description of the machinery of the *Earl of Hardwicke*, which is in every respect a sister ship of the *Vernon*, will suffice to give the reader an idea how both have been fitted up. The engine of the *Hardwicke* is of 30 horses' power, and its paddle wheels are so arranged that they can be shipped or unshipped in a very short space of time. She has also a very simple and ingenious contrivance on board by which the wheels can be disengaged from the engine in one minute, whenever it is desirable that the vessel should use her canvas only. Indeed so quickly can this operation be effected that, during her passage to Spithead, the wheels were connected and disconnected several times during one tacking. The space occupied by her boilers and engine is very small, being only 24 feet in length and 10 feet in width of the main deck, between the fore and main hatchway. The whole is inclosed between decks, no part descending into the hold, nor protruding above the deck. Her consumption of fuel is three tons in 24 hours, and her draught of water 17 feet.

On the Friday previous to the departure of the *Hardwicke* she was visited by Admiral Bouverie, Sir E. Codrington, Mr. Blake, master shipwright of Portsmouth Dock-yard, and many other officers and gentlemen conversant with naval tactics and architecture, all of whom expressed themselves highly pleased with her construction and appointments.

The *Vernon* is to start on her second outward voyage on the 10th of September next, and it is a rather curious coincidence that the same day is that fixed for the departure of the *India* steam vessel of 320 horses' power, and which it is intended shall steam the whole way. An excellent opportunity will thus be afforded for ascertaining the comparative advantages of the two plans. Several bets have already been made at Lloyds' that both the *Vernon* and the *Hardwicke* will make the passage out in less time than the *India*. We see no reason, however, to anticipate any such result. It formed no part of Messrs. Seawards' case in 1829 that they could by steaming and sailing go faster than by steaming alone;

neither can it now. The *India* ought to be the winner; and if she be not, it will assuredly be the fault of something else than the steam power she has on board.

SURGICAL MECHANICS.

Practical Observations on the Nature and Treatment of Talipes or Club-Foot, particularly of Talipes Varus. By William Martin Coates, M. R. C. S. L., of Salisbury, late Teacher of Anatomy and Midwifery a l'Ecole Pratique de Medecine, a Paris. London, Balliere; Salisbury, Brodie and Co.; 8vo., pp. 40, with two plates.

All surgery may be said to be more or less of a mechanical nature; but it certainly is not every surgeon who is a good or even passable mechanic. Sir Charles Bell has laudably exerted himself in his "Treatise on Animal Mechanics," (Useful Knowledge Society's publications,) to show that success in the treatment of deformities of the human person depends, of necessity, on a correct and clear knowledge of the mechanical principles, by which nature is guided in her organic constructions; but with less effect, we fear, on the minds of his professional brethren than the incontestible soundness of his doctrine might reasonably have been expected to produce. All the world would agree in pronouncing that man a madman, who should attempt to correct or regulate the motions of a steam engine, who was not familiar with the end and office of every piece of which it is composed; but how constantly do we "see gentlemen of the faculty," who pass with the world for persons of average sense and humanity, assuming to set to rights the halt and the maimed, who have no more notion of the mechanism of the defective or injured parts with which they presume to meddle, than of the make and form of the people in the moon. How much deep and abiding mortification — how vast an amount of real suffering and injury—may have been caused by such reckless ignorance, (we say *caused*, inasmuch as by knowledge and skill they might have been prevented) it is for no man to calculate. Nature does not more sternly abhor deformity, than do all the sons and daughters of men, be they of what rank or degree they may. The same feeling that made the infant Byron wrathfully exclaim to some one who took notice of his club-foot, "Dinna, dinna, name it,' we see no less expressively exemplified in the case of the peasant boy mentioned in the work of Mr. Coates now before us, (p. 15,) whose deformity in this respect was "so great that his unfortunate parents were ashamed to let him be seen." How much happier and better a man might not the noble minded, yet morbidly sensitive Byron have been, but for that same odious club-foot? How much happier (better, we can hardly say) might not even the more uncaring, and not less illustrious Scott have been but that he too (strange coincidence!) happened to be afflicted with the like personal deformity? And how much more cause have we to lament, that these great men, and thousands of others of lesser note, should not have been spared the many bitter pangs, which all club-footed humanity is heir to, now that we know how certainly the very worst cases of this description admit of cure? Neither the lameness of Byron nor that of Scott was half so bad as the least remarkable of the cases of *complete* cure recorded in Mr. Coates's book. So extraordinary indeed are some of these cases, that the perusal of them leaves us in doubt whether there can possibly be any distortion of the parts of the foot (providing always that all the parts are there,) which may not, by the art of man, if attended to in time, be effectually remedied. Take, for example, the instance of the peasant boy before mentioned, whose poor parents were so "ashamed to let him be seen!"

"Thomas Vivian, aged 15, from Sopley, near Christchurch, has congenial *talipes varus** of both feet. He is of a dark complexion, and stunted in figure, evidently from deficiency in the developement of the lower extremities. *He walks on the upper part of the insteps.* Cushions of hardened cuticle are deposited on the parts which come in contact with the ground. *The soles of the feet are directed upwards, outwards, and backwards;* the balls of the fifth toes almost touching the heels. The toes, with the anterior parts of the feet, are directed obliquely backwards and inwards; *the surfaces, which*

* Club-foot. From *talus*, the ancle; *pes*, a foot and *varus*, crooked.

in naturally formed feet are uppermost, being in contact with the ground. The prominences of the heels are turned outwards and backwards, and are four fingers breadth from the ground. A great deficiency of muscle holds on the whole of the lower extremities, particularly at the calves of the legs. The toes are crowded together, and drawn towards the heels. The articulating surfaces of the os calcis and cuboid, and of the scapboid and astragalus, are quite separated, and placed parallel to the corresponding articulating surfaces of each other. The feet are very diminutive. On pressing the anterior parts of the feet upwards and outwards, the tendines Achillis and plantar fasciæ are tightly stretched, and some uneasiness is felt in the situation of the latter. He can walk two or three miles, but suffers much fatigue and pain afterwards, and from frequent ulcerations on the parts which are in contact with the ground. When he puts on his shoes, the feet seem to be simply turned round, *the heels occupying the situation of the toes, and the toes of the heels.* The bones of the tarsus have but little motion on each other."—pp. 14-16.

Such was the boy Vivian, on the 1st September, 1839, when he first came under the care of Mr. Coates; and certainly a more remarkable case of deformity cannot easily be imagined. On the 1st and 8th September the tendines Achillis were divided, and foot-boards, on the plan of Stromeyer, applied; on the 18th and 19th September the plantar fasciæ were divided (at which the patient "cried out joyfully, his feet were let loose";) on the 6th November the left foot was at right angles with the leg, and on the 24th December the right; and on the 14th January the completion of his cure is thus recorded:—

"Jan. 14. Walks two miles with ease, and the calves of the legs have increased two inches in circumference."

The peculiarity in Mr. Coates's method of treating club-foot, to which its preeminent success is owing—and which has tempted us to go somewhat out of our usual sphere, to lend our humble aid in giving it publicity—consists in the division of the plantar fascia, instead of (as usual) the tibial muscles. It would carry us into a discussion of a kind quite too surgical for our pages, to particularize the various physiological considerations which have led Mr. Coates to the adoption of this method; but we cannot refrain from saying of them generally that they evince a close and most sagacious study of nature, and a most praiseworthy anxiety for the diminution of human suffering. Not only is a more complete cure effected by the division of the plantar fascia than by any other method, but it is accomplished more rapidly, with a more limited use of instruments, and with much less pain to the patients.

Mr. Coates very candidly states that *since* he first performed this remarkable operation he has ascertained that it was done once by Stromeyer, and also that Duffenbach has occasionally performed it; but it would require a great deal more than such insulated and barren facts as these, to deprive Mr. Coates of any portion of the great praise which is his due, for having been indubitably the first, to make the division of the plantar fascia the foundation of a general and successful practice in the cure of club-foot.

The book is illustrated by some clever etchings, by Mr. Read of Salisbury, an artist of more than local celebrity, though not of more than he deserves for the truth and fidelity of his productions.

CONDENSATION.—HALL'S, HOWARD'S, AND SYMINGTON'S PLANS.

Sir.—Though I withdrew from the further discussion of Mr. Hall's system of condensation immediately I was informed it was the subject of an action, I am not precluded from supporting my papers so long as I do not prejudice that question. I think "R. S. M." draws somewhat too rashly upon his lively imagination, when, in reference to my distinction in the two principles of condensation, he would make us believe that Mr. Peterson had said "'Scalpel' is entirely ignorant of the subject upon which he writes." As I can find nothing like it, the ingenuity of the invention must remain with "R. S. M." and not be fathered upon Mr. Peterson.

There is no ground, however, for your *new* correspondent to cavil at my remarks upon the point. The subject in dispute was the superiority of surface condensation over the usual injection, not over patented systems of injection. Mr. Howard's plan I was well acquainted with, about the time its inventor was, unfortunately for himself, spending many thousand pounds, and much talent and spirit upon a scheme that could never repay him. Being one of the two principles of the condensing engine, and particularly the principle I most commended—injection, such plan would but have confirmed the broad distinction I dwelt upon. But had I

mentioned it I must, for consistency have mentioned two or three other attempts at surface and injection condensation, particularly Symington's, also, by injection, and in my opinion the best of all. Such irrelevant matter as the revival of all the systems which had been patented and forgotten had made my paper long indeed. The subject under discussion required simply that the two principles should be distinguished, not their numerous modifications or applications.

Should "R. S. M." favour us with his "second dispatch" let me recommend him to adopt the best style of the late correspondent "Pioneer" not the worst. He can scarcely fail to preceive, if he have watched the discussion, that such unnecessary observations as he himself indulges in prevented the condensation of matter he would aim at, by calling forth replies that made the main trunk spread into so many unfruitful branches. If I am justified in assuming from the paper of "R. S. M." that he is unaquainted with Symington's plan, I beg to suggest his previous knowledge of it, that he may discuss both at the same time. Though I think well of Howard's plan, yet, should it please "R. S. M." to continue the discussion, it may save some time if I inform him before hand that I shall best discover my "entire ignorance of the subject," by endeavouring to show that Symington's is as superior to Howard's, as "R. S. M." may prove Howard's superior to Hall's.

I am, Sir, your most obedient servant,

SCALPEL.

24th August.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

THOMAS KERR, OF FORECROFTS, DUNSE, IN THE COUNTY OF BERWICK, ESQ., *for a new and improved mortar or cement for building, also for mouldings, castings, statuary, tiles, pottery, imitations of soft and hard rocks, and other useful purposes, and which mortar or cement is applicable as a manure for promoting vegetation and destroying noxious insects.*—Enrolment Office, August 22, 1840.

The principal ingredients of this new and improved mortar or cement are assorted into four classes, as follows:

No. 1, is composedof street, road, or house sweepings, ashes, small coal, culm, breeze, river or sea sand, free-stone or other stones pounded, or of any other vegetable or mineral substances in the state of dust, sifted through a bricklayer's or other screen.

No. 2, consists of chalk or any similar calcareous substance of a drying and retaining nature, in the state of fine powder.

No. 3, may be tar, pitch, oil, resin, or other substances of a like bituminous, fatty, or inflammable nature.

No. 4, consists simply of bay or common salt.

These four classes of ingredients are employed in various proportions, using the whole of them, or such part only, and in such quantities, as may be suitable for the purpose required. Thus, for instance, to make a mortar or cement for common buildings:—take one part of No. 2, one part of No. 3 in a melted state, and one part of No. 4; when these ingredients are well mixed, add four parts of No. 1, stirring and beating the whole till it acquires the proper toughness. For buildings of a higher class, the same proportions are to be employed, but No. 1 is preferred of the best river sand, or powdered free-stone passed through a screen of a finer gauge. For plaster work, the same composition is employed, with an addition of the usual quantity of cow-hair, for the first two coats. For flooring purposes, the first composition is employed either hot or cold, using pressure; should it be desired to give the floor a metallic appearance, metal-filings are to be sifted over the cement before it sets. For coating flat wooden roofs, take one part of No. 3, two parts of No. 2, and one part of No. 4; when well incorporated, add two parts of No. 1. The first coating is to be from ¼ to ½ an inch thick; when dry, this is to be covered with strong brown paper cemented on with a mixture of equal parts of Nos. 2 and 3; when dry another coat of the former composition is to be applied, the thickness from ½ an inch upwards, being regulated by circumstances; pressure is to be applied to the composition, and when dry brushed over with Nos. 2 and 3 in equal parts, sprinkling over it a little powdered chalk or other similar substance. For covering the weather boarding of houses, take one part of No. 3, two parts of No. 2, and one part of No. 4, and lay it on with a brush, either hot or cold, giving as many coats, both inside and out, as may be thought necessary. For slate roofs, take one part of No. 3, one part of No. 2, and one part of No. 4: when incorporated, add four parts of fine sand of No. 1. Fill in the joints with a pointed brush, giving two or more coats, so as to stop every crevice. For tile roofs, take the common building cement first described, and fill up all the holes and crevices—then pay the whole roof over with four coats of the cement prescribed, for slate roofs. A similar composition to the last-mentioned, is recommended to be employed for making or mending roads, pavements, bridges, culverts, drains, &c., and its mode of application pointed out.

For mouldings, castings, statuary, &c. &c. take one part of the oil or resin of No. 3, one half part of No. 2, and one-half part of No. 4, then add from four to six parts of real marble or stone desired to be imitated in a fine

powder, and mix into a pliable mass, pressing it into proper moulds by hand or by machinery, which are then to be set to dry in moderately heated apartments, gradually increasing the heat as the hardening proceeds. For tiles and pottery, take one part of No. 3, and one part of No. 2; when mixed, add five parts of common brick clay, moulding and fashioning the articles in the usual manner. Or the tiles, &c., may be made of the usual brick earth, and dipped in the foregoing composition when taken out of the kiln. For fire-bricks and flags, take one part of No. 3, and one part of No. 2, to which add, from 25 to 45 parts of clay, and one part of ground granite or free-stone for every six parts of clay, according to the quantity of silex or alumine in the clay, and two parts of bay salt. For fire-proof articles of this description, pipe-clay is the best that can be used. For fuel, take one part of No. 3, to from seven to ninety-nine parts of No. 1, according to the quantity of vegetable or inflammable matter which it contains, compressing the mixture by convenient means. For gas and water-pipes and other articles intended to be placed under ground, take one part of the pitch (melted) of No. 3, one part of No. 2, one part of No. 4, and four parts of the toughest clay, boiling the whole together. This composition is to be worked into pipes upon an iron mandril, adhesion of surface being prevented by the intervention of thin oiled paper.

The other useful purposes to which these compositions are said to be applicable, are the coating of ropes, cables, bands, rickcloths, tarpaulings, sheathings, and most other spun, twined, woven, and felted articles. It is also proposed to improve some kinds of paper, either by mixing the composition with the pulp in the vat, or by pouring it on the surface of the web before it enters the pressing rollers. For the purposes of manure, take the first-named composition (as for common buildings) using two parts of No. 4, instead of one, and apply in the most approved manner, very full directions for which are given in the specification.

Job Cutler, of Lady Pool Lane, Birmingham, Gent., and Thomas Gregory Hancock, of Highgate, Birmingham, Machinist, *for an improved method of cutting corks and constructing the necks of bottles.*—Enrolment Office, August 22, 1840.

A horizontal spindle running in suitable bearings, carries at either end, hollow conical cutters; these cutters fit on to a square shoulder at the end of the spindle, being secured by a nut and screw. The largest end of the cone which is outward is made very sharp; a small opening lengthwise of the cutter has also a cutting-edge, for reducing the cork to a proper size and shape, as it enters the cone. Another form of cutter is shown, in which the cutting-edge is serrated like a fine sharp saw,—a convenient number of these spindles are mounted in a frame, to which a traversing motion can be given by means of a screw and handle: a number of belts from a large drum passing round the spindles communicate a rapid motion. Pieces of cork are placed in a "holder," which if the cork is large enough, is merely a quadrangular box, but if the cork is in small squares, the holder is furnished with partitions for their reception. The cork-holder being placed in front of the cutters, with a proper support behind, they are urged forward by the hand-screw until the cork has been cut through; a cork-holder is then presented to the cutters at the other end of the spindles and they are made to traverse in that direction, the corks first cut being driven out of the cutters by rods sliding within the spindles, pushed back by the newly entering corks, and so on *ad infinitum.* The improved bottle-neck, is obtained by affixing on the end of the air-tube by which the glass bottle is blown, a mandril or male screw with a square thread; the bottle being blown in a mould in the ordinary way, the air tube is disengaged by unscrewing while the metal is in a soft state, leaving a projecting thread for a grooved cork. The mode of forming this *cork* (by the bye the most curious problem) is not shown, but we fancy if the projecting thread is not too high, cylindrical corks may be successfully employed in bottles thus formed.

BOMBAY STEAM MARINE ESTABLISHMENT.

We understand that the choice of the Court of East India Directors, of a gentleman to fill the important office of chief-engineer of the establishment now forming at Bombay, for the equipment of steam-vessels for the Company's service, has fallen on a Parsee, native of Bombay, Mr. Ardaseer Cursetjee, who has been for more than a year past in England, occupied with most laudable assiduity in making himself practically acquainted with every thing that can be of service to him in the future prosecution of his profession in his native country. Seldom have we known the patronage of a great public body more impartially and judiciously exercised. We hail this selection of a native gentleman as a propitious omen, that justice is at last about to be done to our fellow subjects in India, and that they are no longer to be regarded as less eligible to offices of public trust and responsibility, than Europeans possessing no superiority whatever over them, either in talent or ability. We have been favoured with some interesting biographical particulars of Mr. Cursetjee, but are constrained, from want of room, to defer their insertion till our next.

LIST OF DESIGNS REGISTERED BETWEEN 30TH JULY AND 29TH AUGUST, 1840.

Date of Registration.	Number on the Register.	Registered Proprietors' Name.	Subject of Design.	Time for which protection is granted.
July 27	368	Butcher, Worth and Holmes..	Carpet	1 year.
28	369	Thomas Ginn	Water-closet	3
30	370	S. Ackroyd	Fender	3
"	371	Kinnard, Staite and Co.	Tomb and balcony railing	3
31	372,3,4	George Jackson and Sons	Looking-glass frames	1
Aug. 3	375,6	Ibotson and J. Walker	Gambroon	1
"	377	Griffiths and Hopkins	Dish cover	3
7	378	W. Crook and Son	Stove	3
"	379	Ditto	Fender	3
"	380	H. Jackson	Letter balance	3
12	381,2	H. N. Turner and Co.	Stained paper	1
"	383	Lea and Co.	Carpet	1
13	384	T. England	Instrument or couch for extension of the knee joint	1
17	385	Canon Company	Stove	3
"	386	B. Walton and Company	Ornamental handle	3
20	387	J. Richmond	Chaff-cutting machine	3
"	388	J. Cockran	Thrashing mall	3
21	389	Wilcoxon and Sons	Stained paper	1
"	390	Ditto	Ditto	1
24	391	Lea and Co.	Carpet	1
"	392	Coalbrookdale	Hat and umbrella stand	3
25	393	S. Ackroyd	Fender	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 30TH OF JULY AND THE 27TH OF AUGUST, 1840.

John Louis Bachelard, of Saint Martin's Lane, gentleman, for improvements in the manufacture of beds, mattrasses, chairs, sofas, cushions, pads and other articles of a similar nature, being a communication. July 30; six months.

Felix Troubat, of Mark-lane, merchant, for improvements in the manufacture of vinegar. August 1; six months.

William Daubney Holmes, of Lambeth-square, Surrey, civil engineer, for certain improvements in steam-engines, and in generating and applying steam as motive power. August 1; six months.

Thomas Barnabas Daft, of Birmingham, gentleman, for improvements in inkstands or inkholders. August 1; six months.

James Taaffe, of Shaw-street, Dublin, slater and builder, for improvements in roofing and slating houses and other buildings. August 1; six months.

James Hodgson, of Liverpool, engineer, for a new mode of combining and applying machinery for the purpose of cutting and planing wood, so as to produce plane or moulded surfaces. August 3; six months.

John Sanders and William Williams, of Bedford, iron-founders, and Samuel Laurence Taylor, of Old Warden, in Bedford aforesaid, machine-maker, for improvements in ploughs. August 3; six months.

George Edward Wood, of High-Holborn, engineer, for improvents in pumps, and in engines for drawing beer, ceder, and other fluids. August 3; six months.

William Saunders, of China-terrace, Lambeth, chemist, for certain improvements in paving streets, roads, andways. August 3; six months.

William Beetson, of Brick-lane, Old-street, brass-founder, for improvements in water-closets, and stuffing-boxes applicable to pumps and cocks. August 5; six months.

Colin Macrae, of Cornhill, Perthshire, gentleman, for improvements in rotary engines worked by steam, smoke, gases or heated air, and in the mode of applying such engines to useful purposes, being a communication. August 5; six months.

Theophilus Richards, of Birmingham, merchant, for certain improvements in cutting or sawing wood, being a communication. August 5; six months.

Henry Trewhitt, of Newcastle-on-Tyne, esquire, for improvements in applying the power of steam-engines to paddle-shafts used in propelling vessels being a communication. August 7; six months.

Robert Stirling Newall, of Dundee, gentleman, for improvements in wire-ropes, and in machinery for making such ropes, being partly a communication. August 7; six months.

Andrew Smith, of Princes-street, Leicester-square, engineer, for certain improvements in carriages, wheels, rails, and chairs for railways. August 7; six months.

Thomas John Davis, of 5, Bloomsbury-square, esquire, for certain improvements in the form and combination of blocks of such materials as are now used or hereafter may be used in building or for paving public and private roads and court-yards, or public and private causeways and subways, or any other purposes to which the said form and combination of blocks may be applied. August 8; six months.

Downes Edwards, of Surbiton-hill, Kingston, farmer, for improvements in preserving potatoes and other vegetable subtances. August 8; six months.

John Isaac Hawkins, of College-place, Camden-town, civil engineer, for an improvement or improvements in buttons and in the modes of affixing them to clothes, being a communication. August 8; six months.

Francis William Gerish, of East-road, City-road, ironmonger, for improvements in apparatus to be used as a fire-escape, also applicable to other purposes where ladders are used. August 8; six months.

Samuel Howard, of Manchester, engineer, for certain improvements in boilers and furnaces. August 8; two months.

Baron Charles Wetterstedt, of Limehouse, for improvements in preserving vegetable animal and other substances from ignition and decay. August 11; six months.

John Peter Isaic Poncy, of Well-street, Oxford-street, watch-dealer, for improvements in clocks and chronometers, being a communication. August 13; six months.

Miles Berry, of Chancery-lane, patent agent, for certain improvements in the arrangement, construction and mode of applying certain apparatus for propelling ships and other vessels, being a communication. August 14; six months.

Pierre Armand Le Comte de Fontainemorean, of Skinners-place, Size-lane, gentleman, for certain improvements in covering and coating metals and alloys of metals. August 15; six months.

John Young, of Wolverhampton, ironmaster, for improvements in the manufacture or construction of knobs, handles, frames, tablets, boxes, and other ornamental articles applicable to the decoration of houses and domestic furniture. August 17; six months.

Luke Hebert, of Birmingham, civil engineer, for certain improvements in the manufacture of needles. August 17; six months.

Joseph Lockett, of Manchester, engineer, for certain improvements in manufacturing, preparing and engraving cylinders, rollers, or other surfaces for printing or embossing calicoes or other fabrics. August 27; six months.

Charles Smith, of Exeter, builder, for improvements in the manufacture of lime and cements or composition. August 27; six months.

William Church, of Birmingham, civil engineer, for improvements in fastenings applicable to wearing apparel, and in apparatus for making the same and like articles, and also in the method or methods of preparing the said articles for sale. August 27; six months.

Hugh Unsworth, of Blackwood, Lancaster, bleacher, for certain improvements in machinery or apparatus for mangling, drying, damping, and finishing woven goods or fabrics. August 27; six months.

Thomas Robinson Williams, of Cheapside, gentleman, for certain improvements in measuring the velocities with which ships or other vessels or bodies move in fluids, and also for ascertaining the velocities of fluids in motion. August 27; six months.

Benjamin Hick, jun., of Bolton-le-Moors, Lancaster, engineer, for certain improvements in regulators or governors, in regulating or adjusting the speed or rotary motion of steam-engines, water-wheels, and other machinery. August 27; six months.

Henry Waterton, of Fulmer-place, Gerard's-cross, Buckingham, esquire, for improvements in the manufacture of sal-ammoniac. August 27; six months.

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 22ND JULY AND 21ST AUGUST, 1848, INCLUSIVE.

Christopher Nickels, of the York Road, Lambeth, Surrey, gentleman, for improvements in the manufacture of braids and plats. Sealed, July 23. A communication.

William Palmer, of Sutton-street, Clerkenwell, Middlesex, candle-maker, for improvements in the manufacture of candles, and in apparatus for applying "light." July 23.

Daniel Gooch, of Paddington Green, Middlesex, engineer, for improvements in wheels and locomotive engines to be used on railways. July 24.

Henry Dircks, of Liverpool, Lancaster, engineer, for certain improvements in the construction of locomotive steam-engines, and in wheels to be used on rail and other ways, parts of which improvements are applicable to steam-engines generally. July 24.

Joseph Tunnicliff, of Charles-street, in the City Road, Middlesex, engineer, for certain improvements in the machinery, or process for the reduction or comminution of dye woods, for facilitating the extraction of their "colouring matter." July 27.

Renewal of patent to John George Bodmer, of Manchester, Lancaster, engineer, for the term of seven years, from the 18th of August 1824, granted to him for certain improvements in the machinery for cleaning, carding, drawing, roving, and spinning of cotton and wool. July 27.

Richard Smith and Richard Hacking, both of Bury, Lancaster, machine makers, for certain improvements in machinery for spinning cotton and other fibrous substances. July 28.

Richard Smith, and Richard Hacking, both of Bury, Lancaster, machine makers, for certain improvements in machinery, or apparatus, for drawing, slubbing, roving, and spinning cotton, wool, flax, silk, and other fibrous substances. July 31.

John Aitchison, of Glasgow, in Scotland, at present residing at No. 144, Minories, in the city of London, merchant, and Archibald Hastie, of West-street, Finsbury-square, Middlesex, merchant, for certain improvements in generating, and condensing, heating, cooling, and evaporating fluids. July 31

Richard Beard, of Egremont-place, New Road, Middlesex, gentleman, for improvements in apparatus for obtaining likenesses and representations of nature, and of drawings, and other objects. August 4. A communication.

Richard Hodson, of Salisbury-street, Strand, Middlesex, gentleman, for improvements in the forms, or shapes of materials and substances used for building and paving, and in their combinations for such purposes. August 4. A communication.

John Rapson, of Park-st., Park-place, Limehouse, Middlesex, engineer, for improvements in steering ships and vessels. August 4.

Thomas Oram, of Lewisham, Kent, gentleman, for improvements in the manufacture of fuel. August 4.

Samuel Lawson, of Leeds, York, and John Lawson of the same place, engineers, and co-partners, for improvements in machinery for spinning, doubling, and twisting, flax, hemp, wool, silk, cotton, and other fibrous substances. August 6. A communication.

George Clarke, of Manchester, Lancaster, manufacturer, for certain improvements in the construction of looms for weaving. Aug. 6.

Robert Hampson, of Mayfield Print Works, Manchester, Lancaster, calico printer, for an improved method of block printing on woven fabrics of cotton, linen, silk, or woollen, or of any two or more of them intermixed, with improved machinery, apparatus and implements for that purpose. August 13.

Colin Macrae, of Cornhill, Perthshire, Scotland, gentleman, for improvements in rotary engines, worked by steam, smoke, gases or heated air, and in the mode of applying such engines to useful purposes. August 13. A communication.

Downes Edwards, Surbiton Hill, Kingston, Surrey, farmer, for improvements in preserving potatoes and other vegetable substances. August 13.

William Crane Wilkins, and Matthew Samuel Kenrick, of Long Acre, Middlesex, lamp manufacturers, for certain improvements in lighting and in lamps. August 18.

Charles Wheatstone, of Conduit street, Hanover Square, Middlesex, Esq., and William Fothergill Cooke, of Copthall Buildings, in the city of London, Esq., for improvements in giving signals and sounding alarms at distant places, by means of electric currents. August 21.

LIST OF IRISH PATENTS GRANTED FOR JULY, 1840.

J. H. Young, for an improved mode of setting up printing types.

Orlando Jones, for improvements in treating, or operating on farinaceous matters, to obtain starch and other products, and in manufacturing starch.

F. G. Spilsbury, M. F. C. D. Corbaux and A. S. Byrne, for improvements in paints or pigments, and vehicles, and in modes of applying paints, pigments, or vehicles.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 891.] SATURDAY, SEPTEMBER 5, 1840. [Price 3d.

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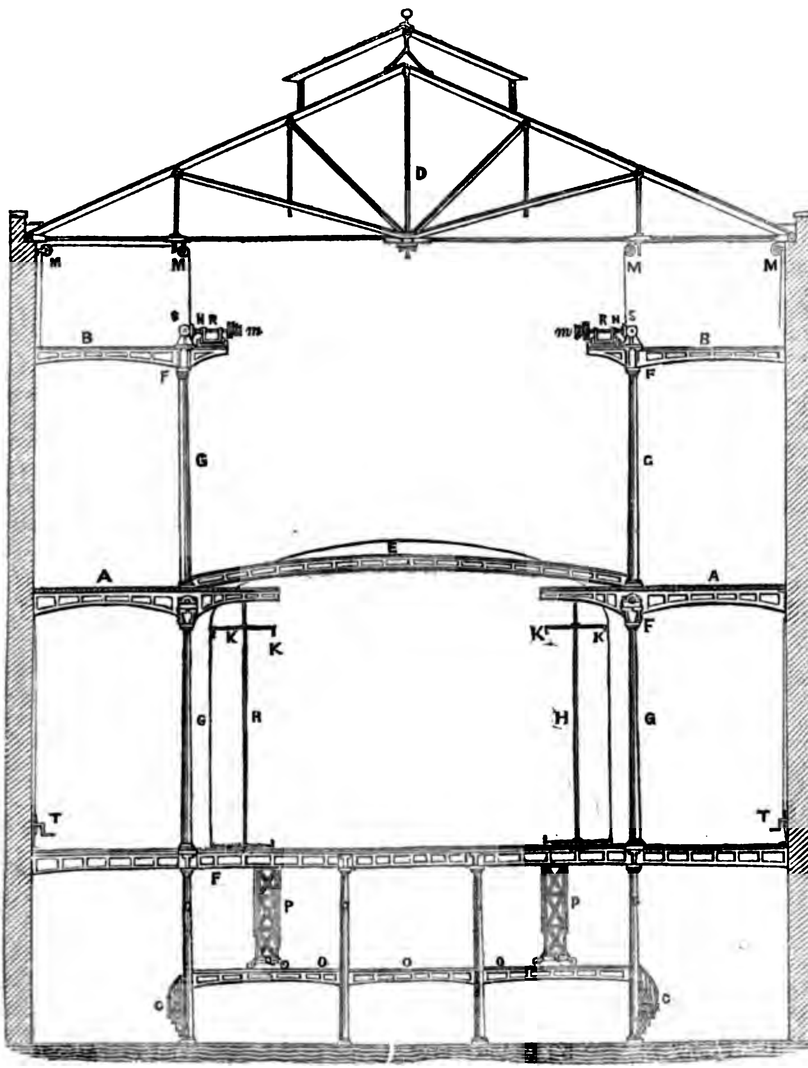
R. M. STEPHENSON'S PATENT THEATRICAL MACHINERY.



R. M. STEPHENSON'S PATENT THEATRICAL MACHINERY.

Such of our readers as have been in the habit of witnessing dramatic representations, must have frequently felt annoyance from the blunderings and mishaps of the scene-shifters: the "magic of the scene" been frequently marred, and the "illusion"—upon the strength of which the whole scenic effect depends—being greatly impaired if not entirely destroyed, by an incongruous assemblage of parts: the side wings of a forest scene coming in to make up "my lady's chamber"—or the adjuncts of a busy market town bounding the sides of a stormy ocean—and such like unnatural groupings. Nor is this all, independent of these occasional absurdities, the whole "machinery" of a theatre, as it is termed, has always been a monstrous rude affair, not having had the advantages of any systematic or scientific arrangement, so that those who best know how these things are managed, only wonder that they go on so well, and that failures are not more numerous.

Recently, however, this subject has been taken up by Mr. Rowland Macdonald Stephenson, who has designed and patented "certain improvements in shifting and working stage scenes and other theatrical machinery," consisting of a most ingenious and perfect system of mechanism for performing all those changes and manipulations, upon the prompt and efficient execution of which, so very much depends. It seems surprising, that any individual not actually "bred and born" within the walls of a play-house, should have grasped with such acumen all the requirements of this ever-varying subject, and have arranged his plans so, as with great simplicity of system, to perform all those complicated flights, evolutions, and changes, so essential to the success of dramatic representations.

The drawing on our front page exhibits a transverse section of a theatre fitted up with Mr. Stephenson's improved machinery. A, are the lower flies; B, the upper flies; C, the stairs to platform under the stage; D, a wrought iron roof; E, border frames, which carry cloths upon which are depicted skies, clouds, roofs, landscapes, the soffits of arches, vaults, &c., and from which they are lowered and raised in succession, over pullies, by an endless chain to one or other of which the two cloths in each set, are attached, at distances determined by the depth of cloth required for the different scenes. These border frames are supported on one frame or base at each side, and are all raised at will, by ropes and counterweights. These border frames may be used as connecting bridges, for flights, and traversing the stage in all directions, as girders for suspension, and for such other purposes as may be required. F, represents girders, beams and bearers, G, columns; H, wing frames, their number being determined by the depth of the stage; (estimated for a large theatre at five pairs,) they may be flat, triangular, or circular, carrying one, two, or three wings at once, and having a forward or retrograde, as well as a rotary motion, which, while within range of the working gear, can contract or enlarge the stage as may be required. Upon these wing frames, the side scenes are placed and worked in succession; they will stand at any desired angle to the audience, and by giving them sufficient inclination will represent close rooms, &c. In each change they revolve 130° or $\frac{1}{3}$ of a circle. K, are keeps at the top and base of the wing frames, to hold the side scenes securely in their places. L is the horizontal main shafting; M, wheels and drums to counterweights; *m*, drums to carry main scenery; N, rack and pinion to shift carriages for main scenery; O, fixed platform under the stage, on which the trap gear P and Q work; P, carriage and gearing of traps; Q, platform upon which P traverses. R, carriages which work the main scenery; S, wheels and gearing of R. T, hand gear for shifting the wing frames H, to regulate the width of the stage.

Horizontal shafting R and W, with intermediate vertical shafts, furnished with suitable wheels, pinions and endless chains, which could not be explained in detail without the aid of numerous drawings, (there are 10 attached to the specification of the patent) connect all the moving parts, so that on turning a winch handle, which carries a pinion gearing into the main driving wheel, motion is given to the whole, and changes at one operation with precision and despatch,

and without noise, thirty-five or more different pieces of machinery:—viz.

10 Side scenes removed from sight.

10 Different subjects brought to replace them.

5 Skies or drop scenes removed.

5 New subjects to replace them.

5 Main scenes lowered, removed and raised.

Mr. Beazley, the architect, so well known for his skill and experience in theatrical building, and Mr. Manby, C.E., have each reported upon this invention in highly favourable terms.

Among the more striking advantages enumerated by these gentlemen as peculiar to Mr. Stephenson's plan are, its facility of application to all theatres, either building or already built; great economy in working, one engineer with four assistants being amply sufficient to perform all those movements, which at present take from 20 to 40 men, and add greatly to the noise and confusion of the place; increased security from fire, the whole of the machinery being of metal is incombustible, while it supersedes the employment of a great mass of highly inflammable materials, and finally, the ease, quietness, facility and precision with which all the movements are performed.

To say that Mr. Stephenson's system of theatrical machinery is the best extant, is no praise, seeing there is no other to compare with it; but from a careful examination of his arrangements, we feel warranted in saying, that his plans are so perfect as to be hardly susceptible of any improvement.

MECHANICAL STEED.

Fig. 2.

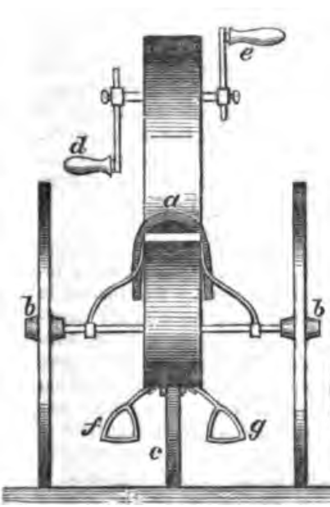
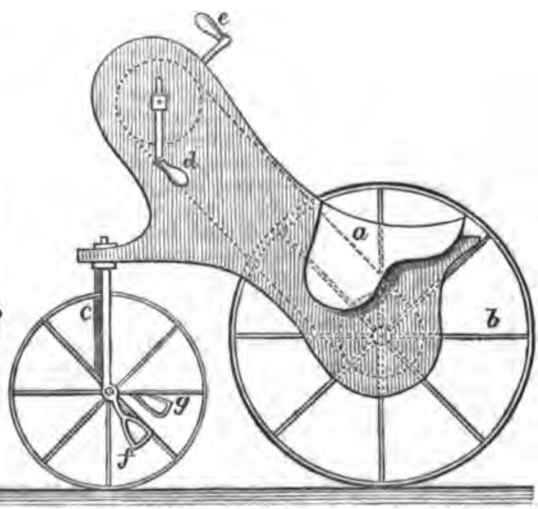


Fig. 1.



Sir,—Several forms of manumotive carriages have been recorded in your journal, to which I now beg to add—if not the most ingenious—certainly the most novel of the whole. Not knowing the inventor, I am unable to pay him the just tribute of acknowledgment; I became accidentally acquainted with his contrivance a few months since at a broker's shop, in the vicinity of Blackfriar's Road; a very common depository, by-the-bye, for cast off experiments of this kind.

The mechanical horse, of which fig. 1 is a side elevation, and fig. 2, an end view from behind, consists of a saddled seat, *a*, supported upon a pair of light wheels, *b*, *b*, (of which only one is shown in fig. 1 for distinctness) with a guiding wheel *c* in front. A pair of winch

handles, *d, e,* have upon their axles two pullies, enclosed within a case which forms the body of the machine; from these pullies, two chains or belts pass round too similar pullies on the axes of the driving wheels *b*. There are two iron stirrups, *f, g,* affixed to the axle of the guiding wheel *c*. The equestrian bestriding the saddle, places his feet in these stirrups, and takes hold of the handles *d, e,* which are made to slide through eyes and held by set screws, so as to adjust the leverage to the strength of the rider, &c. On turning the handles, the driving wheels propel the carriage with a speed proportioned to the power employed, while the guiding is effected by the feet urging either the one stirrup or the other forward according to the direction in which it is wished to turn. As the two handles act upon the wheels *b, b,* independently of each other, the guiding is greatly assisted by turning the one and witholding the other, in going round a corner.

I would, however, call particular attention to a little peculiarity in the manumotive carriage described at page 174 of your 886th number. In all the other numerous contrivances of the kind that I have hitherto seen (the present included) there has been no difficulty in turning—the difficulty has always been to prevent their turning—to keep straight on; they one and all have a most unconquerable tendency to deviate from the "straight path;" their motion greatly resembling the tacking of a ship sailing with an adverse wind—or the reeling vagaries of a drunken man, "having business on both sides of the way." Mr. Squirrell has devised a very simple, but at the same time a most effectual remedy for this annoyance, by placing the axis of the guide-wheel *a little behind the centre* on which it turns; by this arrangement a decided tendency to go straight forward is imparted, without creating any difficulty in guiding the apparatus round curves at pleasure.

The machine from which the foregoing rough sketch was taken, is defective in the driving-wheels, which are not quite large enough, and want more stability, being much too slightly constructed; the form and general arrangement, however, is exceedingly good, and a well-made "hobby" of this description would afford many an hour's pleasant and healthful exercise to persons of sedentary habits.

I remain, Sir, yours respectfully.

WM. BADDELEY.

August 7, 1840.

FIRE WITHOUT COALS.

Sir,—If there be anything to render impracticable the following simple though important scheme by which the metropolis would save upwards of a million sterling per annum, no doubt it will be seen, by some of the numerous and enlightened readers of your excellent and extensively circulated periodical. Instead of having coals brought to London, for which we pay more than one hundred and fifty pounds a ship freight and lighterage, I would suggest, that the railroads to the coal countries be made available, for the conveyance of gas, prepared near the pit's mouth, and by the pressure of the gasometers, sent through pipes attached to the line, into gasometers in the vicinity of London; thence to its destination, for lighting and heating; thus causing a reduction in the price of gas, that would bring it to ninepence instead of nine shillings, which is the lowest present price per thousand cubical feet. This would not only be the means of effecting the above saving of expence, but it would abolish the nuisance of gas houses about the metropolis, "a consummation devoutly to be wished," it would annihilate the London smoke, it would cause the river to be more clear and less dangerous for navigation; instead of black and smoky fire places, in drawing rooms, &c., an elegant ornament as an urn, or a vase, may be substituted, containing twenty or thirty jets, each emitting a brilliant and cheering blaze, and all combining to make one bright and smokeless fire, in the form of a flower, or some tasteful device, according to fancy's dictate, easily regulated at pleasure, and answering to the simple turning of a cock. And when gas shall become as cheap as water, which soon may be expected, all the business of manufactories and steam engines may be done with it, which will obviate the necessity for importing any coals at all.

I am, Sir, your obedient servant,

AN ECONOMISER.

[Professor Aldini, of Florence, when in England many years ago, proposed a plan of nearly the same sort. ED. M. M.]

DIVISION OF THE SEMICIRCLE.—BY WILLIAM S. VILLIERS SANKEY, ESQ., M.A.

Sir,—I have thought that the following series exhibiting the value of the semicircle to radius = 1, might be interesting to your readers, as this series *directly* converges, all its terms being *positive*, and not *alternately* positive and negative, as in the usual series derived from the value of an arc in terms of its tangent. Besides it presents some interesting features connected with the *law of its continuation*.

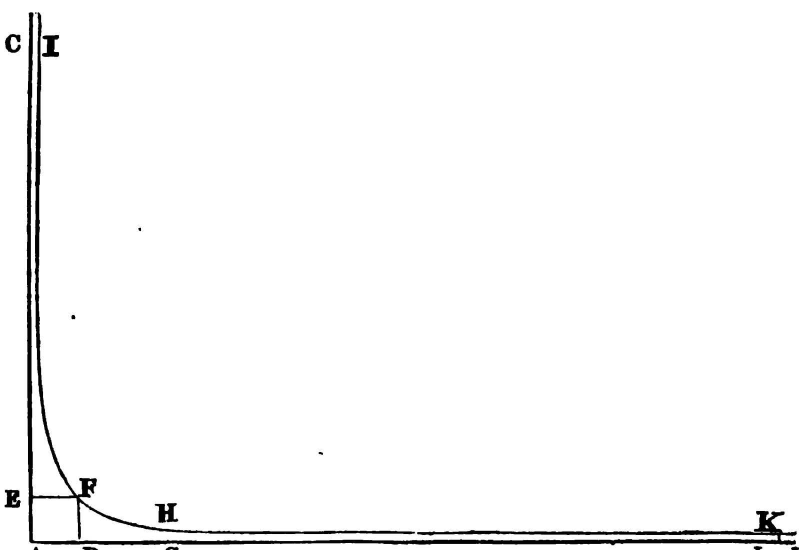
Calling arc of 45, a, its tangent = radius = 1; therefore $a = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11}$, &c., or, taking the difference between the positive and negative terms in each successive pair $a = \frac{2}{3} + \frac{2}{35} + \frac{2}{99} + \frac{2}{195}$, &c.; and halving both sides, arc of $22^\circ\, 30' = \frac{1}{3} + \frac{1}{35} + \frac{1}{99} + \frac{1}{195}$, &c., where we may observe each denominator + 1 forms a perfect square, whose roots are in arithmetic progression; thus, $3+1 = 4 = 2^2$; $35+1 = 36 = 6^2$; $99+1 = 100 = 10^2$; $195+1 = 196 = 14^2$; or to exhibit the law of the denominators more clearly,

$$\text{arc } 22^\circ\, 30' = \frac{1}{(2+0.4)^2-1} + \frac{1}{(2+1.4)^2-1} + \frac{1}{(2+2.4)^2-1} + \frac{1}{(2+3.4)^2-1},$$

&c., or $\frac{1}{2^2-1} + \frac{1}{6^2-1} + \frac{1}{10^2-1} + \frac{1}{14^2-1} + \frac{1}{18^2-1}$, &c., or it might be expressed somewhat differently, thus: arc $22^\circ\, 30' = \frac{1}{3} + \frac{1}{3+32} + \frac{1}{3+3.32} + \frac{1}{3+6.32}$,

&c., $= \frac{1}{3} + \frac{1}{3+1.32} + \frac{1}{3+1.32+2.32} + \frac{1}{3+1.32+2.32+3.32}$, &c. Having, therefore, an harmonic progression, whose two first terms are $\frac{1}{3}$, $\frac{1}{35}$, and taking 1st, 2nd, 4th, 7th, 11th, 16th, 22nd, &c. terms, their sum = arc of 22° 30 to rad = 1, or 8 times sum = semicircle. We may observe that 1, 2, 3, 4, 5, 6, &c., the differences of the numbers, 1, 2, 4, 7, 11, 16, 22, &c., which here indicate the *place* of each term in the harmonic progression increase in arithmetic progression.

This sum might be represented geometrically thus: draw the indefinite right lines



A B and A C at right angles, then on A B take A D = rad = 1, also on A C take A E = A D complete the square A D F E; then, on A B take A G = 3 A D,

and at G erect a perpendicular G H$=\frac{A D^2}{A G}$, with A B and A C as asymptotes through the points F H, describe the hyperbola I F H K. If then, on the asymptote A B, we take successive *abscissæ* A L, A N, &c. = 35 A D, 99. A D, &c., and at L, N, &c. draw the ordinates L K, N M, &c., then the sum of the ordinates D F, G H, L K, N M, &c.= arc 22° 30′ to radius A D; and eight times the sum equals semicircle to same radius.

Since arc $22^\circ\ 30' = \frac{1}{(2)^2-1} + \frac{1}{(2+4)^2-1} + \frac{1}{(2+2.4)^2-1}$, &c., to radius=1, it is obvious that semicircle to same radius$=8\left(\frac{1}{2^2-1} + \frac{1}{(2+4)^2-1} + \frac{1}{(2+2.4)^2-1}, \&c.\right)$

I am, Sir, very truly yours,

WILLIAM S. VILLIERS SANKEY.

30, Harmood-street, London.

M. DELBRUCK ON AUTOGENOUS SOLDERING—IN REPLY TO MR. SPENCER.

Sir,—It is not for me to combat Mr. Spencer's opinion, that the patent laws are unfavourable, and apt to retard the interests and advancement of science; though I believe the contrary is acknowledged, by those who have given most attention to this subject, and who are strengthened in their view of the case, by the liberal decisions now usually given by the judges, so favourable to the interests of inventors. Although it may happen, that dishonest ingenuity sometimes defrauds an inventor of his legal rights, by substituting trifling alterations in his process: such a proceeding is little to be feared as regards patents for *real* inventions on a broad principle, as in mine, for instance, viz.: the junction of metal with metal, without any intermediate or connecting medium—as solder.

I have already observed, that had Mr. Spencer's paper been read at the time it was first announced, it would in no way have affected my patent; for although the publication of my process was only made in your 872nd Number, my patent was then of two years standing, and had long preceded Mr. Spencer's paper.

If, as is too often the case, patentees by setting too high a price upon their licenses narrow the right of using their processes to the few who are content to accede to their extravagant demands; it is not less true, that other patentees, few in number perhaps, pursue a different course. Such persons feel a sort of compensation in satisfactorily carrying out their plans with industry to perfection, and look to the pecuniary part as a matter of secondary consideration; satisfied if they obtain a moderate recompense for the time bestowed and the money expended—they bring their invention liberally before the public, place it within the reach of every one, and show the public that it is *their* paramount interest to adopt it.

With respect to my own invention, the patent Aerhydric Blow-pipe for autogenous soldering, I may perhaps be permitted to state, that a plumber who, by using it might save annually many hundred-weights of solder at 6*d.* or 7*d.* per pound, would only be charged 12*l.* a year for a license.

Again, vitriol manufacturers employ a series of lead chambers, the construction of which has hitherto been both difficult and expensive; for a capacity of 30,000 cubic feet constructed by my process, they are only charged 12*l.* a year patent rent; while it has been calculated by a plumber in London, and his statement confirmed by a vitriol manufacturer, that the saving in the erection of a single chamber, from the absence of overlappings and solder, amounted to no less a sum than 50*l.*

This manufacturer willingly paid me 30*l.* (my prices not then being settled) for the temporary loan of my apparatus; since then, he has been erecting leaden chambers in Wales, and he has taken an opportunity of expressing his entire satisfaction with the full success of my process.

It will be rather a novel thing in this

country, to see a chamber 106 feet long and 26 feet wide, with sides, top, bottom and partitions, of one single piece of unsoldered lead—although it has already ceased to be a novelty on the continent, where numerous manufacturers immediately adopted my process to a very great extent in their establishments, although upon less advantageous terms than those I now offer.*

I have little doubt, therefore, that Mr. Spencer (who by his scientific pursuits, as well as by his particular study of autogenous soldering, is better able than any other person to appreciate its great superiority over the old process,) will acquit me of the charge he brings against patentees generally, of narrowing the utility of their inventions, by excessive pecuniary restrictions. I trust the moderate prices of my licences, either for the autogenous soldering of lead, or for the numerous applications of the *aerhydric blow-pipe* to brass, copper, silver, &c. &c., will except me from this rule. I could say more on this part of the subject but I do not wish to give my letter the colour of an advertisement. I cannot conclude, however, without thanking Mr. Spencer for the kind and frank declaration with which he closes his last communication, alike honourable to him and gratifying to me—that, "it was never his intention to take any advantage to defeat my patent, even had the law allowed it; but that now finding it was sealed so long previous to the period my process was brought forward, he will not willingly throw any facilities in the way of others attempting to evade it, even were that possible."

I remain,
Your most obedient servant,
CHARLES DELBRUCK.

311, Oxford-Street, August 27, 1840.

CASK GAUGING.

Sir,—In the course of investigating Mr. Woolgar's papers on cask gauging in volumes 7 and 32 of the *Mech. Mag.*; together with Dr. Young's, on the same subject, in the 16th volume of the *London Journal*; I have devised a rule of pen, for common arithmetic, so easy of application, so simple, and so unlikely to be forgotten when once known, that I think it worthy of being made public as a competent rival to the sliding-rule; particularly when it is considered, that whereas the latter is an appurtenance that few are likely to be furnished with, a scale of inches and tenths is within the reach of all. In point of accuracy, it will be found, from the comparison hereinafter instituted between it and the logarithmic *formulæ* of Messrs. Young and Woolgar, that it is superior to the former, while with the latter it does not, to say the least, suffer by comparison.

The rule is this:—

To the squares of the head, and bung diameters, add eight tenths of the square of the bung diameter: multiply the product by the length, and the result, cutting off three decimals, will be the contents in imperial gallons.

This rule applied to Hutton's example, is as follows:—

$$\begin{array}{llll} \text{Inches.} & & & \\ \text{Bung} = 32 & \left.\begin{array}{l} \\ \\ \\ \end{array}\right\} & B^2 & = 1024 \\ \text{Head} = 24 & & \tfrac{8}{10}\text{ths} & = 819 \\ \text{Length} = 40 & & H^2 & = 576 \\ & & & \overline{2419} \\ & & L \ldots\ldots & 40 \\ & & & \overline{96{,}760 \text{ Gallons.}} \end{array}$$

In Dr. Young's paper, before referred to, he gives the particulars of twenty-one casks, the dimensions, and actual contents, of which, were furnished to him by authority, as data on which to found his calculations. Between such actual contents, and those found by calculation according to the method laid down by him, he has instituted a comparison, under different heads, to show the degree of accuracy his calculation had attained. In the following tabular view, I have very nearly followed the doctor's arrangement, having reduced the contents furnished by him to imperial measure, and calculated the several dimensions, first by Mr. Woolgar's *formulæ*, at page 216, vol. xxxii; and lastly, by the rule I have just now given.

In the following table, the first line is the result of Doctor Young's *formulæ*, viz. $C = \dfrac{B\,1{\cdot}3533\,.\,H\,0{\cdot}6467\,.\,L}{353{\cdot}036}$

* Among others, in Paris my process has been adopted in the Royal Manufactory of St. Gobins, under the immediate superintendence of M. Guy Lussac; by Messrs. Poisat and Co.; Foucher Lepelletier; Arnold and Bertrand; and Payer and Buron. By Chamillon at Rouen; Kistner and Sons, in Mulhouse; and by Mitchell and Co. at Marseilles.

The second line is the result of Mr. Woolgar's *formulæ* as explained at page 216, vol. xxxii. *Mech. Mag.*

The third line is the result of the rule I have just given, viz. $C = L.\left(\frac{B^2 1{\cdot}8 + H^2}{1000}\right)$

	Greatest Error.	Least Error.	Average Error.	Agregate of Errors.	Error in total Contents of 21 Casks.	No. of Casks where Error is under 1 Gall.
	Gallons.	Gallon.	Gallon.	Gallons.	Gallons.	
Y.	2·9	0·1	1·619	22·3	+ 4·9	12.
W.	1·8	0·1	0·805	16·9	— 1·3	13.
N.	2·0	0·2	0·785	16·5	— 1·1	14.

In these six classes of comparison, the last rule has the advantage, over the first, in five out of six; and over the second, in four out of six.

Mr. Woolgar has suggested two forms of tables for facilitating the calculation of cask gauging. In the first (vol. vii,) three logs are to be extracted from a table, and being added together, they produce a third log, the value of which has to be sought in the same table, in order that the contents of the cask may be obtained. In the second, (vol. xxxii,) three numbers are to be taken from a table, which, being added together, the product must be multiplied by the length of the cask in order to obtain its contents; a process scarcely less laborious than the entire calculation. Now with very great respect for Mr. Woolgar, I beg to ask him whether a table might not be constructed wherein the contents of a cask could be obtained by inspection only? Such a table should consist of two sections; the arguments for the first section being, the bung and head, diameters; and for the second, the number found in the first, together with the length of the cask. Moreover, it would be necessary that one argument, at least, in each section, should be tabulated to the lowest value likely to be required; because it is extremely troublesome to interpolate, by differences, *both* arguments of a table; whereas, if one be given to the lowest denomination, the other can be estimated at sight. Such a table ranging from 18 to 200 gallons would occupy perhaps some 16 octavo pages, but then it would be really what it professed to be, viz.: a *ready* reckoner.

The following is one of the examples from Doctor Young's list, performed by such a table constructed on the principle of the rule given in the first portion of this communication.

No. 20, B. 31·5, H. 23·2, L. 50·1.

Section A, wherein B, is tabulated to 0·1 inch.			Section B, wherein L, is tabulated to 0·1 inch.		
Argt. B.	Argument H.		Argt. L.	Argument, No. from Sec. A.	
	23	24		2300	2400
31·5	2315	2362	50·1	115·2	120·2
					Galls.
Difference 47 × ·2 = 9 + 2315 = 2324			Difference 5 × ·24 = 1·2 + 115·2 = 116·4		

	Gallons.
Actual contents of No. 20	117·2
Contents by table as above	116·4
Do. by Dr. Young's Rule	114·3
Do. by Mr. Woolgar's	115·5

NAUTILUS.

Leeds, August 17, 1840.

HALL'S CONDENSERS—"BRITISH QUEEN," *v.* THE "GREAT WESTERN" AND THE "LIVERPOOL."

Sir,—In looking over your journal of May 2, 1840, I find an article by Mr. Peterson, engineer of the *British Queen*, which contains, in my opinion, nothing but facts, and I cannot help admiring the manner in which he has expressed himself; candour, in a man who writes on subjects of so much importance to the engineers of England and the United States, deserves such praise as is undoubtedly his due.

That there is some jealousy existing between the English and Scotch engineers is very evident; but I cannot see why any man should have the effrontery to praise that which is bad, and ridicule that which is good; had the engines of the *Great Western* been as well built as those of the *British Queen*, the columns and other parts of the frames would not, after so short a time, have been in the dilapidated condition in which they now are.

It appears that "Observator" has not made himself acquainted with all the facts connected with the question, or he would have ceased writing, long ago; and I think, that, if he were to go to Bristol and examine the *Great Western's* engines, and then compare them with the *British Queen's*, he would owe Mr. Hall one more letter, which would fully acknowledge his error.

I can only state to you, what I have seen since British steam ships have visited the port of New York, I have visited the engine rooms of all of them, and admired their construction, nor could I at first find a defect in any of them. Time, however, has proved the *British Queen*, to stand A No. 1. (as we Yankees say). There has not been the slightest failure in her framing, cylinder, air-pump or condensers, the latter I believe to be the best arranged in the world. I have examined the engines each trip, and must acknowledge that the engine-room of the *British Queen* is in better condition than any of the others, and I think with Mr. Napier's talent as an engineer, and Mr. Hall's valued inventions embodied in the condensers, that either English or Scotch engineers will find it difficult to make a better. If "Observator" would have the goodness to measure the areas of the midship section of the two ships, he would find the result would be another feather in the cap of the *British Queen*.

I may also add, that the *Liverpool's* engines wanted nothing but patent condensers to make them equal to the *British Queen's* in every respect—instead of which, their common condensers have already cost the owners a new set of boilers, which, by-the-bye, will beget another question for "Observator" to answer, viz.: "which cost the most, Mr. Hall's condensers or a new set of boilers?" The boilers of the *Liverpool* required patching on her second trip to New York, and on her third, I saw *New York boiler makers* putting on plates 2 feet square. I wish "Observator" to examine the boilers of the *British Queen*, (Mr. Peterson, I am sure will afford him every facility,) and say whether he finds any patches there, and if there are none, (as I know there are not) he will directly acknowledge his error to Mr. Hall, and manfully assert the superiority of that gentleman's plan over the common method.

The opinion of our engineers here was generally not so favourable at first, but from the proof given of their efficacy, the feeling has changed, and I am happy to state, that I have heard within the last few days opinions expressed highly in their favour, and I hope that ere long every boat will have them. There is one river in this great Continent that has more need of patent condensers than any other, viz.: the Mississippi; for in all parts of that river from the mouth of the Ohio to New Orleans, it is found impracticable to use condensing engines, as many trials and failures have sufficiently attested; the mud and other foreign matter held in solution during each season of the year, excluding the use of the common condenser, and I really think that there is no place in the world where Mr. Hall's condensers could be used to greater advantage than on the Western waters. On lake Ponchentrain they are obliged to clean their boilers every trip between Mobile and New Orleans, and nearly all the accidents that have occurred, have been caused by the corrosion and burning of the boilers. I feel confident that if the inhabitants of that quarter knew the value of such an invention, it would be immediately adopted.

I am very happy to see that your journal is so well conducted, and bears on its face such signs of success.

Yours very respectfully,

P. R. H.

New York, August 1, 1840.

MR. GYPSON'S NEW BALOON-VALVE.

Mr. Gypson, the aëronaut, who last season ascended several times in the vicinity of London with an exceedingly handsome balloon constructed expressly for him, made his twenty-sixth ascent last Monday evening from Daventry, in Northamptonshire. The principal attraction on this occasion to scientific persons interested in such matters, and many of whom went from London to witness its effect, was the trial of a new valve placed externally on the top of the balloon, by means of which it was calculated the machine on reaching *terra firma* might be almost in-

stantly emptied of its contents, and rendered stationary, thus enabling the occupants of the car to land without any of those risks arising from the rebounding of the machine, or dragging along the ground. The valve hitherto used opened internally, and its action being, of course, impeded by the upward pressure of the gas, the exhausting of the balloon occupied a considerable time. Mr. Gypson states, that with this new valve, (which, although still susceptible of improvement, answered the purpose for which he had designed it,) he was enabled to exhaust the balloon completely, and render it motionless in forty seconds, so that he and his friends stepped out of the car with perfect ease.—*Times.*

THE WASH-HOUSE NUISANCE.

Sir,—I did not intend to have again trespassed on your columns with regard to this subject, but from the last communication of the "Director and Guardian," I am induced to think he has, in a great measure mistaken the place where steam is generated. I think he will find that very little steam is produced when water ceases to boil, which must be the case in the washing-troughs. I am quite satisfied the copper is the grand source from which the evil arises; let him get rid of it from thence and I believe what remains afterwards will not be sufficient to be called a nuisance. If what is proposed by another of your correspondents, namely not to boil the water, will do, it is, I admit a preferable plan,—but it will not answer when the copper is used also for cooking, as is very commonly the case.

I am, Sir,
Yours respectfully,
M——.

August 17th, 1840.

BOOT-MAKERS BLOCKING MACHINE.

Sir,—I should wish to call the attention of some of your clever mechanical readers to a machine for blocking Wellington boot-fronts, now in successful use by a Frenchman, (in West-row, Carnaby-street,) but who asks so high a price for it, (70*l.*) as to place it out of the reach of most shoemakers. If the price were under 10*l.* very few shoemakers would be without one, for the fronts blocked in this manner are much cleaner and smoother in the grain, and freer from wrinkles or foul leather, than any produced by the ordinary process, especially where the leather is of kangaroo, dog-skin, morocco, or cordovan. Every sort of material, however light, is blocked without the grain being the slightest injured. I am sure, that if these machines could be sold under 10*l.*, there would be a great demand for them, and an immense benefit conferred on the trade.

I remain, Sir,
Your obedient servant,
FREDERICK DOW.

August 15th, 1840.

COCHINEAL OF INDIA.

[*Extract from a Letter of a Correspondent of "The Times."*]

It is now more than 30 years since the above valuable material was first introduced into India from Mexico by a private gentleman residing at Madras. In the early part of the last war the Hon. East India Company, when the price of cochineal was fluctuating from 20*s.* to 25*s.* per lb., held out a premium of 6,000*l.* sterling to any person who might succeed in rearing the cochineal insect in their territory, on such a scale as to enable them to vie with the South Americans in the market. The new colony, on its first introduction into the country, spread itself like a blight over the Coromandel coast, consuming all the "cactus" it alighted upon, until the shrubs were literally smothered with the flocculent coating in which the larvæ of the fly was enveloped. Various attempts were made to domesticate the "cœccus," similarly to the practice in South America, but they proved unavailing, and it was, after some time, allowed to disperse itself whither it might.

Such insects as were cured were sent home to this country, but the samples being found far inferior to those of New Spain, both in size and quality, they were ill received in the market, which circumstance tended at once to damp the ardour of those persons abroad who were engaged in the new speculation. The house of Palmer and Co., of Calcutta, consigned to their corresponding agents in England 10,000*l.* worth of the Bengal insect in the year 1812, but when exposed for sale it proved a complete failure, realizing only 2*s.* per pound, and from that time up to the year 1831, no further notice was taken of the cochineal of Bengal. Indeed, it was regarded as a spurious kind, called in South America the "Grana Sylvestris, or jungle cœccus," and was looked upon as worse than useless. In 1831, however, an individual residing at Cuttack, about 50 miles from Juggernaut, directed his attention to the cochineal of Bengal, and after bestowing much labour and time in testing its various qualities, he eventually discovered that the insect in question was that which was received in the Brazils under the name of "Magno Tinto," which runs very small in size, but imparts a matchless crimson dye, from which circumstance it derives its name. Finding that it

was impossible to rear the insect to anything like the size of the Grana Fina of New Spain, he had recourse to a method which fully justified his expectations. He caused large masses of the flocculent matter to be collected from the various cactus shrubs in the neighbourhood, and bruised the same, when perfectly fresh, in large mortars, till it assumed the form and appearance of a conserve. It was then boiled with clear water in brass coppers, and the fluid strained through fine cloths into shallow tin pans, after which it was exposed to solar evaporation, until a *residuum*, in the form of a black paste, was left behind. This was shaped into moulds, similar to those used in manufacturing the lac dye, and the cakes so made were suffered to dry, after which they were fit for packing. He procured about 1 cwt. of this material, and dispatched it to Calcutta, and under the superintendence of the late Mr. John Palmer caused a trial to be made with it, to ascertain how far it would reach the standard of excellence, when compared with the best Spanish insect. A fair trial was given to both samples, both in the weights and similarity of process, and the Bengal dye was pronounced, on all sides superior to that afforded by the Grana Fina of Mexico. The fact was now established beyond a doubt, that the Indian cochineal was a valuable commodity, if properly handled. But how was the enterprising individual repaid for his pains? Why, when he was about to consign his novel cargo home to England, the Bengal Government imposed a duty of 25 per cent. upon the labour of the man, and the produce of their own territories, which was actually paid into the custom-house, although the Bengal insect was selling in the English market at 1*s.* 6*d.* per lb., and the Spanish was selling in Calcutta at 11*s.* per lb.; thus rating the Bengal cochineal cake at the same value as that of New Spain. This illiberal act on the part of the local Government of Bengal put a stop to any further steps of improvement being taken with regard to the cochineal insect in India. Should a war at any future period break out between this country and South America, the East India Company may then perhaps see the absolute necessity of taking off the exorbitant duty which they have fixed upon the produce of their own land.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

GEORGE WILSON, OF ST. MARTIN'S COURT, ST. MARTIN'S LANE, STATIONER, *for an improved Paper-cutting Machine.*—Enrolment Office, July 21, 1840.

This machine consists of a table and screw press, having a diagonal framing cast in one piece with it at the end. This framing has a groove on each side, in which a sliding frame is moved up and down by means of a screw, worked by a fly-wheel on its top. The upper part of the sliding frame, carries the cutter, or knife, which is simply a long straight steel blade, with a chisel-shaped edge, the flat side being next to the press. The paper to be cut being placed in the press and firmly screwed down, with that portion which is to be cut off projecting under the cutting blade, the oblique screw is turned round which forces down the sliding frame, moving the knife across the surface of the paper, at the same time forcing its way diagonally through its substance, till the whole has been cut through, (?) when by reversing the motion of the screw, the knife is drawn up into its original position, ready for a repetition of the process.

The claim is for a machine for cutting paper by means of a long straight chisel-edged knife, fixed in a sliding frame and forced by machinery through the paper, a motion being given to the knife in one direction, or in two directions at the same time, which may be obtained by applying pressure in an oblique direction as before described.

WILKINSON STEELE AND PATRICK SANDERSON STEELE, MANUFACTURING IRONMONGERS, GEORGE-STREET, EDINBURGH, *for improvements in kitchen ranges for culinary purposes, and apparatus for raising the temperature of water for baths and other uses.*—Enrolment Office, August 5, 1840.

These improvements consist in an improved range, in which the boiler is carried up two feet or more above the level of the bars of the grate, leaving a space at the top for the generation of steam for culinary purposes. The supply-pipe is carried about half way up the boiler, while the exit-pipe is placed at the bottom; this pipe is led away to the nearest drain or sewer, where it terminates in a stop-cock. The various hot-water services are placed upon this pipe between the boiler and the stop-cock. On opening this cock, the contents of the boiler are discharged into the drain, while a jet of water falling down from the supply-pipe stirs up all the sediment or other matter collected in the boiler, which is immediately washed away and a perfect cleansing of the boiler readily effected. To supply this boiler with water, a small auxiliary cistern, furnished with a ball-cock in the usual manner, is so placed as to fill it to within abont 9 inches of the top, that space being necessary for the steam. In order to heat this body of water, the fire is made to act upon the front, bottom and back of the boiler, by an ingenious arrangement of draught-plates which exclude cold air and urge the flames in the direction required. There is also a novel contrivance for ventilating the ovens, &c., a current of heated air being made to circulate within them, the shelves being formed of open or trellis work to facilitate the circulation.

In order to raise the temperature of water for baths or other purposes, a heating-vessel is placed at one end of the range, and the fire directed around it, as in the boiler before mentioned. An elevated reservoir is connected with the heating vessel by means of two pipes, the one communicating with its upper part, the other placed lower down, so as to effect a continuous circulation upwards of heated water to supply the reservoir, and of the colder water downwards to replace it. The reservoir is furnished with an exit-pipe leading to the baths, &c., which is jointed within the reservoir, and furnished with a float-ball which keeps the opening of the exit-pipe about 2 or 3 inches below the surface of the water, so as always to draw off the upper strata (*i. e.* the hottest portion) of the water. The circulation pipes are to be wrapped in tow and enclosed in wooden cases, to prevent loss of heat by radiation.

The claims are: 1, the use and application of a boiler for economically heating a greater quantity of water than has hitherto been effected by the range-boilers in general use. 2, the heating apparatus and its connection with the reservoir for storing up a large body of hot water, and the application of the jointed pipe and float-ball for drawing off the hottest water, as well as the peculiar arrangement for cleansing out the boilers. 3, the application of the whole when combined, for heating the hot-plates, oven, and boilers, &c.

William Brindley, of Northwood Street, Birmingham, *for improvements in apparatus employed in pressing cotton, wool, and goods of various descriptions.*—Enrolment Office, August 22, 1840.

These improvements consist, 1. In an arrangement for pressing and cording bales of cotton, wool, &c. 2. An apparatus by which two or more bales may be pressed at one time. 3. The application of sliding frames to the bed of the press to expedite the process of filling and discharging the press. For these purposes, rollers are placed at the side of the press on which the cord is wound, worked by racks and pinions; the top and bottom plates of the press have grooves cut in them for the cord to lay in free from pressure. In another arrangement the mode of baling and cording two bales in the same press is shown, in connection with the sliding frame by which they are run into and out of the press. The sliding frame rides upon the bed of the press and is guided by angle irons, being set in motion by a winch-handle and pinion taking into a rack cut on the slide-frame. The press itself is not claimed, but only the application of these *supposed* "improvements" to presses generally.

William Cook, of King Street, Regent Street, Coachmaker, *for improvements in carriages.*—Enrolment Office, August 22, 1840.

These improvements relate solely to "German shutters" employed in carriages. These shutters are composed of three folding parts, the first being hinged to the top of the carriage and the others hinged to it. The principal improvement, consists in the application of springs to the drawing up and supporting of these glazed shutters at the top of the carriage. For this purpose, a box containing three coiled springs in barrels, like clock springs, is affixed to the top of the carriage. From these springs, three silk cords pass over friction pullies down to three points of attachment in the three leaves of the shutter. While the shutters are in a staight line these springs have no power over them, but if it is wished to raise the shutter, by pulling a strap they are brought into an angular position, when the springs instantly draw them up out of the way.

Richard Cuerton, Jun., of Percy Street, Middlesex, Brass Founder, *for improvements in the manufacture of cornices, mouldings, and window sashes.*—Enrolment Office, August 22, 1840.

These improvements consist of a mode of shaping and affixing sheet metal on the surfaces of wood or other substances, so as to obtain all the advantages, in appearance and durability, of metal, without the weight. For this purpose, the moulding is first struck on the wood with planes, &c. in the usual manner; if the pattern is a complicated or full one, it is given to the sheet metal by swaging tools and dies, in a manner well understood by workmen; the metal is then placed upon the wood moulding and drawn through a suitable die, which unites the two by driving the edges of the metal into the substance of the wood. If the pattern is a plain one, the previous swaging of the metal is dispensed with, and the pattern is struck down upon the wood by the die through which it passes. An arrangement for sharpening the edges of the dies from time to time, is also shown.

COMPARATIVE PROGRESS OF STEAM NAVIGATION IN GREAT BRITAIN, AMERICA, AND FRANCE.

Report of Count Daru to the Chamber of Deputies, in the name of a Special Commission intrusted with the Examination of a Projected Law relative to the establishment of Steam Packets between France and America.

Gentlemen,—A high regard for the interests of the public has given rise to this projected law, of which we are about to render an account. The point in question is, the establishment of these means of conveyance which, in long voyages, give to sea travelling a regularity and despatch which might be compared to that which we have already obtained on railways. The experiments lately performed at Liverpool, and which were crowned with such brilliant success, prove that, for the future, the vast expanse situated between Europe and the two Americas is no longer inaccessible to steam.

By means of powerful machines, steam packets traverse the ocean; the compass is their guide; steam gives them the means to maintain the direction which they should take, so that, thanks to the happy assistance of these two great inventions of the human genius, the irregularity of arrival, the uncertainty and delay incident to sail navigation are dispelled, and give place to regular, expeditious, and safe passages.

It was in 1807 that the first steam boat appeared: it was constructed by Fulton; its engine had a power of 18 horses, and accomplished the passage from New York to Albany in 33 hours. It was the lot of North America, whose streams, lakes, extensive coasts, interrupted by enormous bays and covered with islands, are so well adapted to the establishment of steamers, to enter the first in this career, and to cement by means of this wonderful instrument of communication, the bond of unity between the population scattered on its soil in a state of isolation, and almost completely without communication with each other.

The progress of steam navigation there was rapid. We see in an official report presented on the 13th of December, 1838, to the American Congress, by the Secretary of the Treasury, that 1,300 steam boats have been built in the United States from 1838 up to 1839; of these 800 are still serviceable.

In England the first steamer was launched on the Clyde in 1811. It is not uninteresting to see the progress made by Great Britain in this particular. The last statistical reports published at Liverpool give on this point the following data:—

There were in 1812 only 2 steam boats in England, in 1814 only 5, in 1825 there were already 168; in 1835, 538; in 1839, 840.

We here see in what a considerable ratio these numbers have successively increased.

In France the first attempts date scarcely sooner than from 1820, and it was only in 1826, after many fruitless attempts, that a regular service of steam packets was established on the Saone. Our progress, therefore, has been slow in the career which other nations had thrown open. The cause of this is perhaps the bad state of our rivers. The Rhone is an impetuous stream and difficult of ascent. The Loire, extensive and changeable in its course, offers a depth of water which is frequently insufficient. The Seine has its frequent bends. Now, in every country, steam navigation was, in the first place, established on rivers, because their course offers fewer obstacles, requires less powerful engines—in short, presents greater facilities for circulation than are offered by the sea. For several years, however, our advancement has been evident. In the last account given by the mining administration we see that, in 1833, we had 75 steam boats: in 1834, 82; 1835, 100; 1836, 105; 1837, 124; 1838, 160. This statement does not include Government steamers, of which there are 38, carrying engines of from 160 to 250 horse power.

Thus England holds the first rank, the United States the second, and France the third.

The form, dimensions, and power of steam boats evidently depend on the service to which they are destined. They were not long merely employed in the ascent and descent of rivers, but soon the limits of steam navigation were enlarged, increasing the power of the engines from 20 to 80, 160, 200, and 250 horses, it became possible to extend the field of their employment to venture on the sea with them. Towing boats, which had been constructed in a few ports, soon threw a light on the superiority of the new system, by bringing out large vessels, weather-bound and condemned to inactivity, and drawing them in their wake with a facility which seemed to defy the elements. From that day the bright days of sail-navigation, which till then was looked upon as the *chef-d'œuvre* of human understanding, were eclipsed. Now vessels were started on every coast; regular and rapid communications linked together every important town, such as Havre, London, Dover, Hamburgh, Rotterdam. This was the forerunner of more daring attempts.

In 1819 a vessel from the United States, the *Savannah*, had crossed the ocean from Liverpool to New York, partly by wind and partly by steam. America, then, had the lead again in daring to apply Fulton's machine to long voyages; and this is the more remarkable, that it has always had but few steam boats on sea service. This first essay was not repeated, until, in 1835, when the English undertook the passage from Falmouth to the Cape of Good Hope: the *Atalante*, provided with an engine nearly similar to that of the *Savannah*, accomplished in 37 days a distance of 2,400 nautical miles. The *Berenice*, the *Medea*, the *Zenobia*, performed passages of different lengths on the coast of Africa, and in the Indian seas. All these boats were English. In the Mediterranean, steamers of different nations, Neapolitan, Sardinian, Austrian, French, crossed from one port to another. Lastly, our service of steam packets from Marseilles to Alexandria was established, and threw open to us a new access to the East. The passage to Constantinople, which was sometimes 45 days in duration, was thus reduced to 18½ days.

These numerous experiments gave rise to the idea that, by the aid of steam, it was possible to accomplish the distance between Europe and the United States. The difficulty of carrying the necessary quantity of coals for the consumption of an engine acting, without interruption, from one shore of the ocean to the other, during a space of from 15 to 20 days, was no longer an obstacle. It had been discovered that the consumption of combustible did not increase in the same ratio with the power of the movers,—that an engine of 250 horse power, for instance, was far from burning twice as much fuel as was necessary for an engine of 125 horse power; that, moreover, certain parts of the mechanism might be simplified in such a manner as to take up less room, and, consequently, leave more space at disposal for the accommodation of passengers or merchandise. From this time operations were commenced, and on the 4th of April, 1838, the first experiment was tried. You are all acquainted, gentlemen with the result. You all beheld the enthusiasm excited by the success of the voyage undertaken by the *Sirius*, 15 days had been sufficient for its passage. Scarcely had this vessel arrived in the port of New York when it was joined by the *Great Western*, which started from Bristol on the 8th of the same month, after a passage of 14 days.*

Henceforth the problem was solved. America was nearer the European continent by half the distance which formerly separated them. There could be no more doubt concerning it: the events which have since occurred have ratified these first expectations.

The *Great Western* has crossed the Atlantic 28 times during the period of the 14 months just elapsed without accident, maintaining an almost uniform speed, of which the average time was 16 days going, and 13 to 14 days coming back; the last voyage was even accomplished in 11 days and a half.

We have entered into these details, gentlemen, in order to show by what successive steps, and at what pains these great results have been obtained. Their very tardiness is a pledge and a proof of their stability. This is no new idea; but a project, the execution of which has been sought after for the last 30 years. The human understanding has pro-

* The length of this boat is 236 feet, its depth 23 feet 3 inches, its width outside the paddle boxes 58 feet 4 inches, draught corresponding to the load-16 feet, tonnage 1,340 tons. The engines are so constructed as to diminish the consumption of steam and fuel. It is said that they consume 33 tons of coal a day. The total cost of the vessel when it was launched was 55,000*l.*; since that time improvements have been effected in it which have amounted to 15,000*l.* It carries 700 tons of goods, 135 passengers. The rest represents the weight of the engine, the boilers, and the water.

ceeded in this circumstance as it always proceeds in inventions of a durable nature—by uncertain attempts. Fulton's machine received, little by little, at the hands of its constructors, those improvements which time and experience are sure to occasion. Now the end is attained. The facts are undeniable; they have taken place in broad daylight. Let us now look into the consequences.

This is an event of no ordinary character, gentlemen—this approximation of the two worlds, and this new instrument delivered into the hands of maritime powers. An uninterrupted chain of communication established among numerous nations, until then divided by enormous distances, brings forward new relations among them. The flux and reflux of these nations towards one another increase the sphere of action of each. It is more than a revolution of commerce and industry; for when two individuals are brought together, their contact, the conjuncture of their efforts and of their minds, changes entirely the reciprocal conditions of their isolated state; when two nations, then, are brought into closer communication, the effect increases in the proportion of one man to the whole society. Nor can France, accustomed to serve as a medium and link between Europe and the United States, and who owes to her fortunate situation between three immense seas the advantage of beholding travellers from one continent to the other flock to her shores, remain unmoved, and in some sort indifferent in the presence of such an event.

In these days, thanks to publicity, no secrets are hid in the industrial world No sooner is a discovery made than it immediately becomes the property of every one. Every country may reap its advantages. If this discovery be important, if it be destined to introduce radical changes in the relative conditions of the power and influence of nations each must adopt it, or run the risk of dwindling into an inferiority and impotence which will prove, in the end, the source of bitter regret. For, if we have remained stationary, if we have not increased in the same degree with our competitors in influence and wealth, we lose the power of interfering, with dignity, in the destinies of the world, and of adding our weight to the balance of important interests discussed in it. Steam is in the same predicament as gunpowder, printing, the compass, and the telegraph; every nation will adopt it, because all, out of self-preservation, must do what others further advanced in civilization have done. Woe to those who should not understand this necessity. There have been, at long intervals, periods when the genius of man has, in this manner, changed the conditions of labour and wealth. It was dearly paid by those nations who did not acknowledge and receive the new facts which the effects of science had disclosed. Why has Venice lost that ascendancy on the sea, which it had enjoyed during four or five centuries, if it was not that, the discovery of the Cape of Good Hope having thrown open regions until then unknown to commerce, she remained an inactive spectator of this revolution! Why have two great nations, Spain and Portugal, who were indebted to the genius of Columbus and of Vasco de Gama for their prosperity—why have they since fallen, if it be not that they slept on their riches and left other nations to invade the openings they had made. In this continual and peaceable conflict of opposed interests, our weakness or our strength, our consideration or contempt, will depend on our understanding of the times, our appreciation or miscomprehension of the drift of events.

These are the motives, gentlemen, which have, doubtless, induced the government to lay before you the projected law on which you are called upon to deliberate. It has felt that its duty was to hasten the development of steam-navigation in France; that the interest of our commercial relations and our political influence commanded us to act, and to act immediately. A few words will sufficiently prove in what manner any delay would be fatal. You are aware that the principal branch of our external commerce is North America; that it participates to the amount of 138,000,000 in our importation, and 171,000,000 in our exportation. We exchange our wines, silks, &c., for the cotton, tobacco, &c., of the United States. Now, this great and fruitful source of our commercial prosperity is threatened: England is in advance of us; she has established, and is organizing at a considerable expense, lines of packets which bind all her old colonies, now emancipated, to their former metropolis, and to which they are still united by a similarity of blood, of language, and of origin. If we do not wish to be driven from these distant markets, we must do for the Atlantic what we have done in the Mediterranean.

During two years since they began their operations, with what strides have the English advanced?

A first line from Bristol to New York was established in 1838. The company to whom it belongs has four steamers of 450 horse power, namely, the *Sirius*, the *Great Western*, the *William* and the *Liverpool*. The price of each of these boats is 1,300,000 francs. It is said that they now are building an iron steamer, which is to carry two engines, whose united powers will amount to 1,000 horses. These engines are constructed on the plan of Mr. Humphreys; the boat will only be 100 meters in length, and will have room for 300 passengers, and a considerable quantity of merchandise. The works are in active continuation, and will be terminated, according to appearances, in the course of the year 1841.

Another line was established for the service of London and New York. Two vessels were employed on it—the *British Queen* and the *President*; the engine of the *British Queen* is of 500 horse power, that of the *President* 600; they can accommodate from 225 to 250 passengers, and receive a load of from 500 to 600 tons. A third line connects New York to Liverpool, so that there are already three establishments sending steam vessels from different parts of Great Britain to the United States.

Moreover, a contract was sealed on the 4th of July, 1839, between the Admiralty and Mr. Samuel Cunard, for the transit of letters from Liverpool to Halifax. Mr. Cunard has engaged that there shall be two departures per month, and receives from the government an annual remuneration of 1,500,000 francs. The *Britannia*, of 450 horse power, was launched in the beginning of February, 1839.

Lastly, a more extensive service will soon connect Great Britain with the West India islands: there is a company in existence under the name of the Royal Steam Navigation Company, which is preparing vessels for New Orleans, Mexico, and part of the South American coast. This Company the government indemnifies by an annual payment of 6,000,000 francs.

You must all perceive, gentlemen, that we must not delay entering into the lists, for we are urged on by competition from every quarter, and the appearance of English steamers on every point of the New World to the exclusion of our own would soon banish us from those regions.

However serious the character of these motives, gentlemen, they are, however, secondary when compared to a consideration which we will not endeavour to conceal. The navy is a weapon, and one which to all appearances is destined to play an important part in the conflicts which a future day may bring to light. Attempting to foretell what consequences may be reserved for a future period by the introduction of steam in constructing ships of war would be presumptuous; it is a question of entirely recent origin; experiments with regard to it are in their infancy. It is, however, already discernable that the use of new motors will infallibly produce the following effects:—

In the first place, it will render every vessel in similar conditions equally supple and tractable, by whatever men she may be manned. It will be sufficient to have able engineers in order to effect manœuvres with a facility and precision as entirely in-

dependent of the state of the sea as of the greater or less aptitude of the sailors.

Secondly, the number and proportion of the men required for the performance of the ship's duty would be entirely changed. The *Great Western*, whose form and dimensions are nearly those of an ordinary frigate, is conducted by 50 men, including engineers and stokers. Now, if it be true that the naval enrolment of France is incompetent to supply all its necessities, this inconvenience will vanish; and the more so, because the zone in which we shall be able to find men fit for the service will be extended.

Lastly, the draught of water required by a steamer depends upon its power; but for all it is less than that of ships of war. Whence it follows, that instead of the five or six ports to which our vessels and frigates can resort, steam-boats will be able to cast anchor off any coast, and, so to speak in any bay.

Thus the new vessels provided with a good engine will be swift, will offer less hold to the enemy, will have a greater number of safe harbours to resort to, will require a less numerous crew, and require less previous apprenticeship than in sailing vessels. This will evidently become a new weapon; and if these ships carrying guns for the discharge of bombs of a recent invention, whose effect is such that at one discharge they are capable of disabling the largest craft, they will become a weapon at once easy of management, safe, and of the most destructive nature. Is there not wherewithall here to change the whole direction of naval tactics, all the proportions existing between the powers of nations? Here is an entire revolution. Slow or fast, partial or complete, this revolution will ensue. Now, with the example given us by a government whose energetic endeavours are dedicated to the continued increase of its naval resources, when we see Great Britain during two years continually multiplying, at the cost of such enormous sacrifices, its steam navigation, and finding in the gigantic establishments of its industry those inexhaustible resources of which we are deprived, would it be wise, would it be prudent to continue our *material* in its present state, to abstain from making some progress in the new career which has been traced out to us? Undoubtedly we do not indulge in the chimera that our country can ever equal the English in their naval establishment. The strength of the British nation rests entirely on its foreign trade; they are an exclusively seafaring nation. All the springs of its prosperity are there; it drags after it that colossal superiority which constitute at once its greatness and its peril. The conditions of existence in which France is situated are different; but the extent of its coast, its position, the genius of a portion of its inhabitants compel it to possess a navy, and therefore it is fit that, wherever she may be pleased to hoist her flag, she may be enabled to assemble and display a sufficient force in order to insure respect. Without this she could never effectually protect her national interests beyond the seas.

The construction of steam-boats for transatlantic voyages presents, then, a double object to our view. Applied, in time of peace, to the growth and preservation of our commerce, they may be transformed, during hostilities, into ships of war; they may assume, in turn, the double character of a defensive weapon and of a means of conveyance—of a commercial and of a military marine; to-day they may carry merchandise, and when requisite guns.

Thus, to conclude, two principal considerations have decided your commission to adopt with one consent the idea contained in this projected law:—first, the necessity of preserving our foreign markets; secondly, of maintaining the established balance and equilibrium between the powers of England and France. United now by bonds of the closest friendship, neither of these great nations is desirous of renewing conflicts now extinguished. We devoutly wish that this happy concord, to which we owe the peace of the whole world, may continue; but, for its very duration, the position of both must be honourable, their union must not depend upon the decay of one and the aggrandisement of the other, but on their equal and simultaneous development.

After thus explaining and justifying the grounds of the law, our next duty, gentlemen, is the examination of its details. The two first questions to be solved are these:—Towards what points must our steam-boats be directed? and from what ports must they set out?

[The Report then takes an elaborate view of the foreign commerce and relations of France with which we need not trouble our readers, and concludes as follows.]

To what then does the question resolve itself? The construction of three steam-packets, the cost of which would amount to 5,000.000f. The lines of steam-navigation will have this in common with railroads, that they will not only become subservient to existing relations, but will give rise to new ones. Such have everywhere been the consequences. Witness the steam-packets from Havre to Hamburgh, with which so many similar enterprises were connected; witness again the steamers on the Red Sea. The English East India Company had for several years established a service of despatches between Bombay and Suez, in order to accelerate its communication with Europe. But this service, up to 1838, was far from meeting every desire. The number of its steamers was not sufficient, a long interval succeeding between the days of departure, and travellers were frequently obliged to wait the uncertain passage of some vessel for Alexandria. The establishment of French steamers in the Mediterranean completely changed this state of things. No sooner was our line in active operation than the English Government immediately instituted measures to insure regular departures three times a month from India to Suez, so as to coincide with the arrival of our boats. The result is, that letters arrive in the space of thirty or forty days instead of three months time, which, before then, they required for the journey. Communications across the Atlantic will, to all appearances, occasion similar results; that the progress may be tardy, that the enterprise may remain for some time in suspense, we do not deny, but the political question to us seems to overbalance the pecuniary question.—*Times translation.*

NOTES AND NOTICES.

The Fire Preventive Company.—The recent disastrous fires in the metropolis, naturally attract the attention of every friend of humanity to discover the best means to provide a remedy against the repetition of such calamities. A society has been formed, under the title of the Fire Preventive Company, and an experiment on the most extensive scale was tried some time since under the direction of Mr. Shepherd, the surveyor of the company, at Manchester. In the autumn of the year 1838, the experiment was repeated upon premises in the Clapham-road, to the perfect satisfaction of numerous spectators. (Vide *Mech. Mag.* Nos. 778 and 809.) The attention of the Government has been so far attracted to this subject, that after experiments performed at the works of the company, Upper Ground-street, Blackfriars, in the presence of Colonel Fanshawe, Captain Jebb, R.E., and of Mr. Ewart, principal engineer at Woolwich, the Lords of the Admiralty have directed that the engine-rooms of the steam-frigates *Medea* and *Lucifer* shall be fitted up on the principle of this company. On Tuesday last an experiment was made at the works of the company by exposing a tripartite flooring to the heat of the furnace of a brick-kiln. The first of the divisions was composed of a ceiling worked with two coats, and set with the fireproof cement, leaving the laths naked; the second with the laths protected by the cement, but not spread out; the third with two coats of the cement, and set with

common plaster. The first division was, to use a technical term amongst builders, jugged as usual, and coated with the preventive cement. Upon this, in the ordinary structure of a dwelling house the flooring would be placed. Upon a rude structure with all the disadvantages of draughts and currents of air, a frame divided into the three compartments already described was placed, and subjected to an intense heat. The result of the experiment was, that while the suppositious floor of the apartment beneath was wholly destroyed, the upper stories of the model-house were preserved safe; and when No. 1, or the floor unprotected by the cement, grew hot, the rest—namely, divisions two and three, were respectively in comparative degrees of coolness. The singularity and advantage of the composition is, that it is equally applicable to old and new buildings. The principle has been extensively adopted inLancashire and other northern counties, and only requires to be understood to command general approbation.

New Postage Label.—Within the last few days, all labelled letters passing through the post office, have been defaced with a black stamp. This change has been adopted in consequence of the red stamp having been so effectually obliterated, as to allow the label to be used over again; the Post Office authorities have, therefore, adopted the common-sense plan of using printing ink—so that any compound erasing the *cancel* would at the same time most effectually destroy the label also.

New Floating Fire Engine.—At the fire at Hore's Wharf last week, a new floating-fire-engine, just completed by Mr. Tilley, for the London Fire Establishment was brought into action. It consists of an iron boat, in which two engines are placed side by side, the handles extending lengthwise of the boat. Each engine has two working barrels, 9 inches diameter, with an 8, 10, or 12 inch stroke at pleasure. Upon this occasion one of the engines was unfortunately rendered *hors du combat* by the failure of one of the piston-rods, but the other continued to deliver a powerful stream of water upon the burning mass. The other two floating engines were also brought to bear upon the fire, and the quantity of water thrown by these, and a numerous body of land engines, has been estimated at 17 tons per minute.

Hardening of Steel.—Mr. John Wimbridge, of Presteigh, has discovered a chemical process, by means of which steel may be so hardened as to cut glass more easily than the diamond.—*Port of Tyne Pilot.*

Launch of two Iron Steamers.—Saturday, August 17th, *two* wrought-iron steam vessels were launched from the yard of Messrs. Ditchburn and Mare, Blackwall, an occurrence we believe never before witnessed on the Thames; one was named the *Swallow*, intended for the Baltic, the other the *Elberfeld*, for the Rhine. Messrs. Penn and Son, of Greenwich, are the engineers for the former; Messrs. Miller and Ravenhill, Blackwall, for the latter; the engines in both vessels are oscillating.

Hint for House Decorators.—The walls had a novelty of decoration not peculiar to Affghanistan, as I have seen it in India, though never so well done as in the rooms I speak of; the chunam or plaster being stamped when moist or plastic, and worked into a pattern, over which a varnish of powdered talc is spread, which more nearly resembles the richness and hue of new and unused frosted silver plate than anything I have seen elsewhere. This might be introduced in London as a very cheap and elegant drawing-room decoration.—*Dr. Kennedy's Campaign of the Army of the Indus.*

The Archimedes patent screw-propeller ship.—This vessel made the voyage from Plymouth to Oporto in 70 hours; and on Wednesday morning intelligence was received of her return from Oporto to Plymouth in 88 hours—total out and home 158 hours, the most part of which was performed against strong head winds and a heavy sea. This is unquestionably the most successful voyage ever made by a steam vessel, the efficient working power of which has been ascertained not to exceed 65 horses, and, we imagine, there can no longer be any question as to the superiority of patent screw propellers as compared with paddle wheels.—*Sun.* The conclusion of our contemporary is wholly unwarranted by his premises. The total distance performed was only about 1,600 miles, the average per hour little more than 10; a rate of speed which has been times out of number far exceeded by paddle-wheel steamers, and indeed even by sailing vessels. That the adoption of the screw-propeller may, under many circumstances, be attended with great advantage, there can be no doubt; but that it is superior to the paddle wheel has never yet been proved, and we do not believe can be proved.

Cultivation of Cotton in America and India.—The saw-gin commonly used for cleaning cotton in the United States, of which, and its inventor, Eli Whitney, an interesting account will be found in our 17th vol. p. 430, is capable of producing from 1,100 to 1,200lbs. of clean cotton per day, whilst the churka, the machine in general use in India, produces no more than from 30 to 40lbs. in the same time. But for the inventor of the gin indeed, neither the cotton produce of the United States nor the cotton manufacture of Great Britain could ever have attained to such prodigious magnitude as they have done. The East India Company, desirous of introducing the use of the gin into our Eastern possessions, and also the species of the cotton plant grown in America, which is greatly superior to the best known in India, lately sent over to the United States an intelligent officer of their service, Captain Baylis, with instructions not only to procure every needful information on both points, but to engage persons skilled in the American modes of culture and cleaning, to proceed to India to assist in their introduction there. Captain Baylis returned a few months back, and report speaks most favourably of the results of his mission. He has had a gin constructed at Liverpool on the most improved plan of those which he saw in use in the United States, and on the 17th inst. he made an experimental trial of it on specimens of cotton of Indian growth, in the presence of a deputation of the Manchester Chamber of Commerce and other gentlemen interested in the cotton trade manufacture. The Manchester deputation, in a report which they have made on the subject, state that "the result was upon the whole highly satisfactory, as proving the practicability of cleaning Indian cotton by means of the American saw-gin, though, no doubt, experience will be necessary to adapt the gin to the species of cotton which had to be operated on; and there may also be some difficulty in India in providing the power necessary to drive machines of that description."

Mechanics' Institution on its Travels.—Leicester, Monday 24th. About half-past 12 o'clock this day a train, the longest perhaps ever known, came along the Midland Counties Railway from Nottingham. It had four engines to drag it forward, and to the beholder appeared like a moving street, the houses of which were filled with human beings. The occasion of this extraordinary sight was a return visit made by the committee and friends of the Nottingham Mechanics' Exhibition to the Mechanics' Exhibition of this town. The number of carriages was 67, and the number of passengers nearly 3,000, most of whom were well and respectably attired. On the banks for a considerable distance, and also near to the station, tens of thousands of spectators had assembled to greet their arrival, and the scene altogether was one of the most imposing that can be conceived. The Duke of Rutland's excellent band was in attendance, and played an appropriate air as the train entered the company's premises, and afterwards preceded the cavalcade that was formed to proceed to the New Hall, where the exhibition has been for some weeks opened. About 7 o'clock the train set out on its return to Nottingham, when the crowd collected to witness their departure appeared quite as great as on their arrival.

Errata.—In list of patents, page 255, for "George Edward Wood," read "George Edward Noone."

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CHESTERMAN'S PATENT SELF-REGULATING STOVE.

Fig. 1.

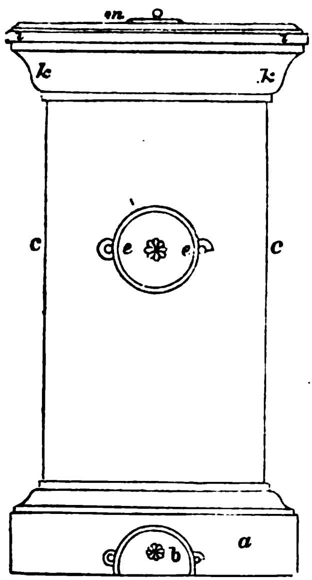


Fig. 2.

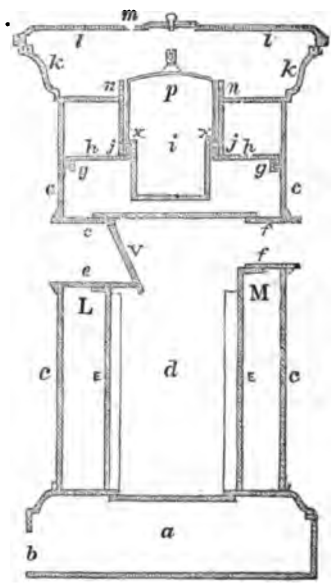


Fig. 3.

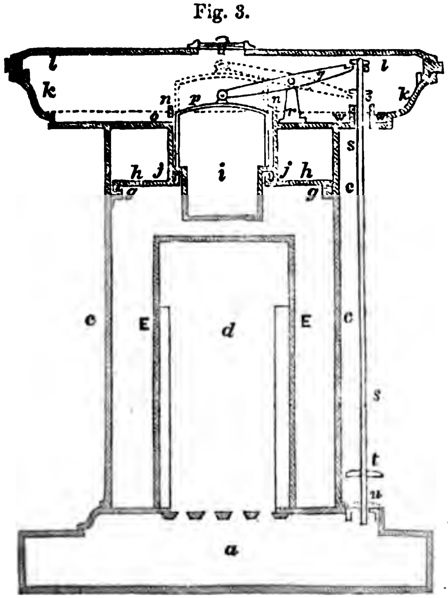
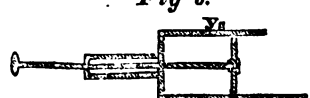


Fig 4.

Fig 5.



CHESTERMAN'S PATENT SELF-REGULATING STOVE.

The principal novelty in this stove, is the mode adopted for regulating the rate of combustion, and consequently the temperature of an apartment, by means of the vaporization of water. The arrangement adopted by the patentee will be understood by the following description, reference being had to the drawings on our front page, of which fig. 1 is an external elevation of a cylindrical stove with a square base and top; fig. 2 and 3 are vertical sections, taken diagonally to each other, in order to show the various parts; the same letters of reference apply throughout. *a*, is the base or ash-pit; *b*, the ash-pit door; *c*, the cylindrical case or body of the stove resting upon the base *a*, the joint being made air-tight with a luting of sand or cement in the usual way; *d*, is the firebox lined with fire-clay, bricks, or other suitable materials, furnished with a grate or set of fire-bars, either fixed or moveable. Near the top, and on opposite sides are the two sockets L and M, cast on, or fitted air-tight to the fire box *d*, one of which receives the mouth-piece *e e*, and the other the flue pipe *f f*. The fire box *d* is perfectly closed at its upper end, and at its sides, except where the sockets before mentioned are situated; *e, e*, is the mouth piece for the supplying of fuel to the fire box *d*, the outer door of which is closed in the ordinary mode; this mouth piece fits closely against the side of the cylinder or body *c*, and into one of the sockets attached to the fire box *d*. *f, f*, is the flue pipe fitting closely against the opposite side of the cylinder. *g* is a rim fixed to and projecting from the inside of the cylinder *c*; *h* is a guard-plate fitting into the rim *g*, and covered about an inch deep with sand. *i* is a cylindrical vessel or water box, having a rim *j*, which dips into the sand covering *h*; the water box *i* passes through the plate *h*, as shown in the drawing; *k* is another vessel of quadrangular form, cast in one piece with the vessel *i*, or fitted thereto in a water-tight manner, and resting upon the top of the cylinder *c*; *l*, is the top or cover to *k*, fitted with a water joint which is kept constantly supplied by the condensation of vapour rising from the water in *k*. A ventilator *m* is placed on the cover *l*, for allowing steam to escape into the apartment from the water in *k*; *n*, is a rim projecting from the bottom of the vessel *k*, immediately over and corresponding with the vessel or water box *i*. In fig. 3, *o* is a small hole in the rim *n*, about ⅛th of an inch in diameter, to allow water to pass from the vessel *k* into the water box *i*, to supply the loss by evaporation; P is an inverted cup which works vertically in the water box *i*, like a gasometer or gas-holder; *q*, is a lever moving freely on its centre, supported by the pillar *r* fixed to *k*; one end of *q* is attached to the centre of the convex top of *p*, and the other end to a rod or wire *s*, supporting a horizontal disc *t*, over the aperture *u*, through which the external atmospheric air is admitted into the ash-pit *a* to supply the fire. The rod *s* moves freely through a hole in the end of *q*, but is prevented from passing through it, by a nut on its end which rests on the upper side of *q*. *w*, is a tube proceeding from the bottom of *k* to the same height as the rim *n*, in order to prevent the water from running out, as it would do if there were only a simple hole. In the position shown in the drawing, the inverted cup *p* (being heavier than the rod and disc attached to the other end of the lever *q*,) preponderates in the water box *i*, supporting the disc *t* at its greatest height from the aperture *u*. The vessel *k* and the box *i* being filled with water up to the dotted line, and a fire lighted in *d*, the water in *i* will be first heated, and steam will be gradually formed within the cup *p*, which will eventually raise it, at the same time causing *q* to descend and diminish the draught of air into *u*. If the water should reach the boiling point, the cup *p* will be raised to such an extent, as to entirely close the air-passage *u*, the apparatus assuming the position shown by the dotted lines. In consequence of the supply of air being thus shut off, combustion will be stopped, the temperature of the water will be lowered, and the formation of steam will cease, when the cup *p* will sink, and acting on *q*, will gradually raise the valve *t* until the supply of air and the rate of combustion is sufficient to maintain the stove uniformly of the temperature required, which may be regulated by the nut on the top of *s*.

Another modification of the apparatus is described in the specification, in which

a pipe in connection with the water box *i*, is coiled round the fire-box in a spiral direction, so as to make the action of *p* more sensitive; this pipe, it is stated, may be carried round an apartment before it returns to the water box *i*, and the heated water circulating therein will materially assist the operation of the stove in the rapid diffusion of heat.

The following arrangement is adopted for the supply of fuel to these stoves while in action, so as to prevent any smoke or deleterious gas escaping from them into an apartment. The door in front *e*, *e*, being opened, shows a cylindrical tube fig. 4 having its inner extremity bevilled off and closed by a plate V hinged at top and shutting by its own weight. To supply the fuel and still keep this tube closed, a feeder or scoop, fig. 5 is contrived, with which the fuel is put into the door: a piston, attached to a rod passing through the handle, pushes the fuel out of the scoop into the fire box *d*, the valve, or plate V, yielding to admit it, and then closing again immediately. Two stops or abutments, on the scoop *y*, *y*, prevent its being pushed too far into the stove, and likewise steady it while the fuel is being ejected by means of the piston.

REMARKS ON MR. SMITH'S PATENT SCREW PROPELLER AND CAPTAIN CHAPPEL'S REPORT OF EXPERIMENTS MADE WITH IT IN THE "ARCHIMEDES" STEAM SHIP. BY J. P. HOLEBROOK, ESQ.

Sir,—I could have wished that the task I have imposed upon myself in making the following observations had fallen into more able hands; nevertheless, I cannot stand by, an idle listener to the extravagant opinions which are afloat, in respect of the application of the principle of the screw to a propeller for steam vessels made by Mr. Smith, and at present under trial in the *Archimedes* steam vessel, without raising my voice against these opinions, and without attempting to communicate to others the conviction I entertain, that neither this nor any other modification of this principle, can ever be effectively and economically used as a substitute for the common paddle wheel; and I trust, from the able and public-spirited manner in which your valuable periodical is conducted, that you will deem the object I have in view a sufficient excuse for trespassing upon your space with these remarks.

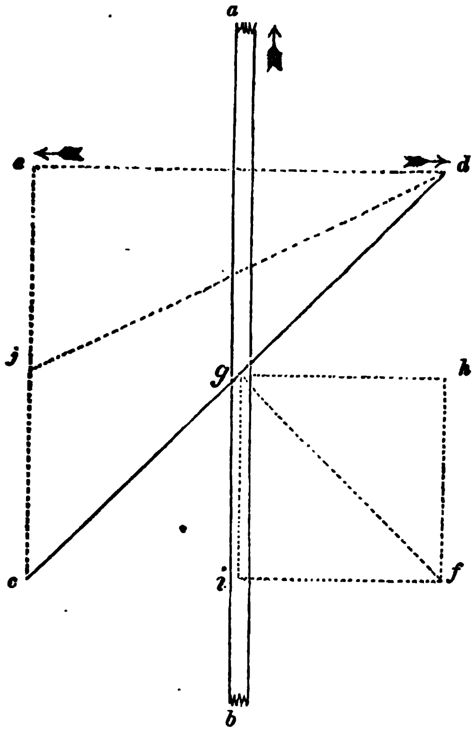
In the pursuit of my object, I shall consider myself bound to offer such scientific evidence of the soundness of my opinions, as the popular character of these observations will allow; and I am happy to say that the view I take of the subject under consideration is just that which will admit of such evidence being produced, while the other side of the question depends for its support only upon appeals to experiments, of which we have but a very few conditions, and upon recourse, for want of better argument, to ideas perfectly incompatible with any continuity of reasoning. I allude here, sir, to some of the remarks which have of late appeared in your pages, in favour of the screw propeller. I am perfectly aware that, in pursuing the course I have marked out for myself, I may lay my account with charges of prejudice, and of wishing "to stay upon the ancient ways;" but I shall console myself, under these inflictions, with the reflection that, in this respect, the fate both of the opposers of real improvements, and of the resisters of inutile projects, is alike the same. I shall recal to mind the enthusiastic opinion of the wonder-loving people of two years since, with regard to Joyce's stove and Murphy's almanac; and I shall also reflect upon the *present* satisfaction of those who *then* gave their opinions against these novelties, though at the time they were only considered as prejudiced, and as detracting enviers of the talent which, not hoping to reach, they were supposed to wish to crush; and, if I should need further consolation, I shall reflect upon the course pursued in your pages of late by the arguers in favour of Mr. Samuel Hall's system of condensation; though, if the opinions I have of Scalpel's remarks are well founded, that system, which has blazed away at such a rate in the public press, appears destined ere long to share, if it has not already shared, the fate of its preceding and alike noise-creating brethren. But to my immediate subject.

The application, as a propelling instru-

ment, of the common under-shot water-wheel, would seem, from the facility with which a continuously rectilineal forward motion for a vessel could be obtained, from a continuously rotary one of wheels placed at the vessel's sides, to have called for no great exercise of ingenuity in the first applier of it; but the proposal of a screw for a propeller would seem to result only from considerate calculation, inasmuch as no one would imagine, from a first impression, that the necessary continuous rectilineal forward motion for a vessel could be obtained from a continuous rotary motion laterally, or in other words, from a motion calculated neither to advance or retard a vessel, and, indeed, only producing motion at all by an *inclination* of the surface which is made to rotate laterally. This mode of attaining a rectilineal motion is one which would seem, at first sight, to be rather curious than useful; bearing in mind that the principle of the screw is never applied, in the solid form, except in cases in which we desire to acquire strength at the expense of space, and in which we can afford to lose the certain quantity of power necessary to overcome the friction attendant upon the application of the principle. But it might be, that that which is only curious at a first view, might, by the exercise of perseverance and ingenuity, at last be made to be more useful than an instrument which clearly, under first impressions, appeared to be better and more simple. Recollecting this, it will be my object to prove that, in discarding the paddle-wheel, and in adopting in lieu of it a screw for a propeller, we shall make an alteration neither warranted by first impressions, nor borne out by the recorded and well-established general principles of mechanical science.

Elementarily considered, the screw, when applied to the purposes of propulsion, may be viewed as two flat surfaces oppositely inclined to the line of desired motion of the vessel, and made to move in continuously rectilineal directions at right angles to that line, each surface moving in a direction diametrically opposite. For practical purposes, the continuously rectilineal and opposite motions, just mentioned, of the two inclined flat surfaces may be replaced by one continuously rotary motion of one turn of the thread of a screw. When a propeller of the last kind is employed, we find, looking at any two opposite parts of the thread, that one of these parts is oppositely inclined to the other, and if we consider the direction in which any two such opposite parts rotate, we shall also find that the direction of rotation is oppositely different: practically, therefore, one turn of the thread of a screw being made to rotate, fulfils in a great measure all the useful conditions of two flat surfaces, oppositely inclined and moving in opposite continuously rectilineal directions, besides being a more simple and a practicable mode of attaining the end desired. Further, we shall not greatly err if, in order to ascertain the effect produced in the way of propulsion, by any power exerted upon the screw, we consider the reaction of the water upon all the parts of the screw which are at the same distance from its axis, to be concentrated upon any one of the points, which are at the same distance from the axis; and this mode of estimating the effect of the reaction of the water, will besides materially facilitate and simplify the process of explanation. It may, perhaps, be as well here to state, that in the course of my argument I shall scarcely avail myself of my own ideas, but shall, in a great measure, depend for the strength of my case upon parts of two chapters of two treatises, which, though popularly written, may still be considered good authorities in the case of a question of the present kind: the two treatises and the two chapters to which I refer are, chapter ix, of *A Treatise on Hydrostatics and Pneumatics*, by the Rev. Dion. Lardner, published in 1831, and chapter v, of *A Treatise on Mechanics*, also by the Rev. Dion. Lardner, published in 1830.

The manner in which the reaction of the water is affected by the angle which the thread of the screw makes with its axis, appears first to demand attention. In order to facilitate my explanation, I shall refer to the following diagram; in which let *a b* represent a part of the shaft upon which the screw is placed, this shaft being supposed to be situated at the stern of a vessel; and let *c d* represent a part of the circumference of the thread of such a screw as that with which the Archimedes is fitted.



become longer, and, agreeably to what has just been stated, the resistance greater; until *c d* becoming similar in direction with *a b*, *c e* will be lost in or will be *c d*; at which period the resistance will be greatest against the surface *c d*, which will of course, under such circumstances, not be at all inclined. On the other hand, if we suppose the angle to be greater between *c d* and *a b*, or that *d* is placed farther from *a*, and *c* farther from *b*, then the line *c e* will be shorter, and the resistance less; until *c d*, being supposed to cross *a b* at a right angle, *c e* will have no existence; and therefore there will be no resistance against the surface *c d*. Thus, it will be seen that, if we desire to obtain *great* resistance or reaction from the water, we must make the inclination of *c d* from *a b* *small*; while if we wish to obtain *little* resistance we must make the inclination of *c d* from *a b*, *large*. Quoting from Dr. Lardner's hydrostatics, with merely a variation in the letters, we find that "In trigonometry the number which expresses the proportion of *c e* to *e d* is called the sine of the angle at *d*, and thus the resistance to a surface moving in a liquid, is said to increase or decrease in proportion to the square of the sine of the angle which the direction of the surface makes with the direction in which it is moved."

By the chapter of the Treatise upon Hydrostatics just mentioned, it appears that the resistance of the water to the passage of such part of the thread of the screw, will depend, as far as the angle it makes with the axis of the screw is concerned, upon the square of the line *c e*, as compared with the square of the line *c d*; and, as the length of the line *c e*, is, as regards the length of the line *c d*, in the proportion of ·7 to 1·, the resistance upon the inclined surface will, upon its being put in motion, in the direction of the arrow *d*, be as the square of ·7 or ·49, or about one-half of what the resistance would have been upon the same surface, if it had not been inclined from the direction of the axis, but had corresponded in parallelism with that direction. If we suppose the inclination of *c d* with *a b* to be less than in the diagram, or that *d* is approached nearer to *a*, and *c* to *b*, then it will be perceived, upon a little consideration, that the line *c e* will

The resistance thus determined, is not the resistance effective in propelling the vessel, but merely that resistance, which must be overcome to put the inclined surface in motion. This must be self-evident, when we consider that, when *c d* is paralleled with *a b*, and the resistance greatest, the power acting upon *c d*, has no tendency whatever to drive the shaft in the direction of the arrow *a*, but merely to press it in the direction of the arrow *e*; and, if we consider the action of *c d* upon the shaft, to be counteracted by another and opposite inclined surface, then the whole power employed, both upon *c d*, and such other inclined surface will be effective only in agitating the water, and not operative in the slightest degree in propelling the vessel. On the other hand, if we suppose *c d* to cross *a b* at a right angle, then, there being no resisting surface, any power employed in making *c d* rotate, will also not be effective in making the shaft to move forward or backward. In the former case, there is great resistance and great

agitation of the water, but no propelling force: in the latter case, there being no resistance, there is no agitation of the water, and also no propelling force. But, in all other, than the two extreme cases just noticed, there is propelling force as well as resistance: and a mode of estimating the amount of the propelling force from a given resistance in any direction I shall now show, and in doing this, I shall avail myself of a mechanical process, called the "parallelogram of forces," and expressed, according to the treatise upon mechanics before mentioned, thus: "If two forces be represented in quantity and direction, by the sides of a parallelogram, an equivalent force will be represented, in quantity and direction, by its diagonal."

In our diagram before given, let *f g* represent the reaction of the water against the inclined surface *c d*, then *f h* will represent the force effective in pressing the inclined surface *c d* in the direction of the arrow *a*, and *f*, *i*, a force effective in impelling the same surface *c d* laterally; the value of *f h*, as compared with the value of *f g*, is as ·7 to 1·; and, consequently, there is a loss of power by the mode of employing it upon the inclined surface *c d*, in this case, of 3 out of 10, or about 30 per cent.

Let us now examine the results arising from making the surface *c d*, more nearly approach in direction to the line *a b*. If we suppose the line indicating the reaction of the water, to be of the length of *f g*; then, a little consideration of the necessary alteration of the diagram, will show that *f h* will become shorter, and the power employed on *c d* will, consequently be less effective in propelling the vessel; until, when *c d* shall coincide with *a b*, the line *f h* will be completely lost, and, by consequence, whatever power is employed upon *c d* will be altogether ineffective in propelling this surface *c d*, forward, and entirely consumed in impelling it laterally. If, on the other hand, we suppose *c d* to depart further from *a b*, and the line *f g* to be still of the same length, then, *f h* will be increased in length, and, consequently, any power employed upon *c d* will be proportionately more effective in propelling the vessel, and less active in impelling it sideways; and this increase of effectiveness will go on until, when *c d* crosses *a b* at a right angle, *f h* will correspond with *f g*, and, consequently, *f g* will be entirely effective in propelling the vessel forward, without at all impelling it laterally. But *f g* itself can have, in this case, no existence, inasmuch, as I have before shown that *c d* will, under such circumstances, be passing with its edge only in the direction of the arrow *d*, and consequently, will not be meeting with any resistance; and, it is evident, without resistance, no propelling effect can ensue. Of course, here, as in other cases, there will be a resistance derived from the friction of the water, but it is clear that such resistance can have no propelling effect; a resistance of this kind being only effective in retarding motion or wastefully consuming power: the only useful sort of resistance being that arising from the inclination of the rotating surface from the line of motion of such surface.

In the preceding observations, *c d* has only beeen considered to form a part of the thread of the screw; but, it is evident, except where there is an unequal reaction from the water, arising from a variety of circumstances, that what we have said of this part *c d* is true, as regards the whole of the thread; we may, therefore, assume *f g* in our diagram to represent the amount of the action of the water upon the whole of the circumferential parts of the thread, as well as the action upon the particular part *c d* alone; in which case, *f h* will also represent the force effective in propelling the vessel, and *f i*, the force operating to impel it laterally. I shall next examine the inclination of the thread of the screw, between the circumferential parts and the axis, supposing, as in the case of our diagram, the thread, and its circumferential parts, to make an angle of 45° with the axis: my purpose in this being to show the most proper form of construction of the screw, when used as a propeller.

If the thread of a screw, 7 feet in diameter, makes at its circumferential parts, an angle of 45° with its axis, it will make one turn in about 22 feet; and if, as in the case of a propelling screw, whatever be the diameter of the parts, interior to the circumferential parts,—if, I say, there can only be allowed one turn of the thread of the screw, during the whole length of the screw at its circumferential parts, or, in our supposed case, during 22 feet, the thread must incline less and less from the axis as the diameter of the

parts becomes less and less, until, supposing the thread to be continued to the axis, it will then represent the axis itself. This must be evident, when we consider that the thread of the screw must constantly advance through the length of the screw, or 22 feet, while the space through which it passes laterally, or, in a circular direction round the axis, is continually diminishing, in consequence of the circle, that measures the parts which are nearer and nearer to the axis, becoming smaller and smaller. This may be plainly illustrated, by supposing an equal quantity to be taken off each end of the line *e d*, and also from the line *c d*, and then turning *c d*, until its new end, *d*, met the new end *d*, of *e d*. It will be clear that *c d*, under such circumstances, will make a less angle with *a b*, than it does in our diagram. In such a case, *e d* would represent the diminished circle, and *c e*, the undiminished length of the screw, or the length of 22 feet, as at its circumferential, and also as at all its other parts.

I have thus far endeavoured to establish, as regards the properties of such a screw, as that with which the *Archimedes* is fitted, or one in which the thread is continued from the circumferential parts to the shaft, three positions.

First:—That the resistance, or the consumption of power is greater as the line *c d* approaches, the direction of *a b*.

Secondly:—That the resistance of the water against the surface *c d* gives, as this surface approaches the direction of *a b*, a less and less effective propelling power, supposing the resistance to be the same—and,

Thirdly:—That, in a screw, whatever the angle be which the thread makes with the axis at its circumferential parts, or whatever the inclination be of *c d* from *a b*, this inclination wlll continually lessen as the axis is approached; or, in other words, that *c d* will, in such a case, continually approach nearer in direction to *a b*.

If I have been successful in my endeavours to establish these three positions, they will afford great assistance in understanding, what the construction of a screw should be, in order that it may be productive of the most useful effect: if it can be at all serviceable for such a purpose.

Let us, for the present, suppose we are examining the properties of a screw, of which the diameter is 6 feet, and the thread of which makes, at its circumferential parts, an angle of 45° with the axis of motion. In such an instrument, it is clear that while the circumferential parts are passing through a circle of 6 feet in diameter, the parts halfway between the circumferential parts and the axis are passing through a circle of only 3 feet in diameter, and, consequently, through only half the space. Now, if the resistance at the circumference of the circle of 3 feet diameter were equal, the result would be that power would only be consumed in proportion to the circumference or to the diameter of the circle, and that, therefore, this resistance gave a proportional effective propelling result, power might as well be employed at the circumference of the smaller circle as at the circumference of the larger. But if our first position is established, we have shown that the resistance at the circumference of the smaller circle is proportionally greater than at the circumference of the larger circle; and we have endeavoured to show, in our second position, that were the resistance at the circumference of the smaller circle proportionally the same as at the circumference of the larger circle, the useful propelling effect would be less, and, consequently, it would be desirable to consume as little power as possible on the smaller circle, and as much as might be on the larger circle. This would be desirable, if the resistance were proportionally equal to both circles, but we find, by our first position, that the resistance increases more than proportionally faster; and, consequently, if we consume power on the smaller circle, we consume it, if the resistance were only proportional to the diameter of the circle, with a less useful effect; but, as the resistance is more than proportional to the diameter of the circle, we consume it still more disadvantageously, because we consume it in a *more* than proportional quantity, with a *less* than proportional result; and, consequently, it follows, that we should consume it, under such circumstances, with two elements of loss, one resulting from a *more* than proportionate resistance, and the other from a *less* than proportional effective result. Now as what has been stated in respect of a supposed circle of 3 feet in diameter is equally true

of any circle whose diameter is less than that of the circumferential parts of the screw, it follows, from what has already been said, that all the power to be most usefully effective should be employed at the circumferential parts; but this mode of applying it being evidently impracticable, we should make practice best assist theory by consuming all the power upon parts of the thread of such a screw as we have just been considering, as near the circumference as the resistance necessary to be obtained from the water would allow.

By our third position we showed that the thread of a screw which made a certain angle with the axis at its circumferential parts, would make a less angle as the parts of it were nearer and nearer to the axis; and by no great stretch of reasoning, it will be evident that if the circumferential parts were prolonged to a greater distance from the axis, the prolonged circumferential parts would make, *vice versâ*, a greater angle with the axis, and as this greater angle, by our second position, would give us a more than proportionally greater useful effect, it would follow, that by increasing the diameter of the screw we should increase its efficiency as an economical propelling instrument; but as the limit to which a propeller of this kind must, from its situation as regards the vessel, be necessarily small, and as all the useful effects of increasing the diameter could be equally produced by an increase in the velocity of the supposed screw of 6 feet diameter and by an alteration in the inclination of the thread as regards the axis, I shall only consider the effect which would be produced by such an increase of velocity, and such an alteration of inclination. Let us now, therefore, suppose that *j d* of our diagram represents the altered inclination of *c d*, and that *j d* passes in the direction of the arrow *d*, with twice the velocity with which *c d* before passed. Now, agreeably to what has been before stated, as the sine of the angle made by *e d* and *j d*, is only half of the sine of the angle made by *e d* with *c d*, so the resistance against *j d*, would be diminished in the proportion of the square of the diminished sine *j e*; or the resistance would be only one quarter of what the resistance was against *c d*; but as the velocity with which *j d* would move, would be twice the velocity with which *c d* moved, and as the resistance to a body passing through the water is proportional to the square of the velocity with which it moves, so the resistance to the passage of *j d* would be four times what it would have been if *j d* had passed with only the velocity with which *c d* passed. Thus we have the resistance to the passage of *j d* diminished in the proportion to the square of the sine, or of *j e*, and we have also the resistance of the same *j d* increased in the proportion of the square of its velocity. By the less measure of the sine, *j d* meets with only one-fourth of the resistance with which *c d* met; but then, by the velocity with which *j d* moves, as compared with the velocity with which *c d* moved, this resistance of one quarter is quadrupled, or it is exactly the same as that with which *c d* met.

Now, there arises from this variation in the inclination an advantage, which if not counterbalanced by some disadvantage, would leave us free to acquire almost the greatest possible economical effect from a screw propeller properly constructed. This will be understood from a comparison of the line *j d* with the line *c d*, for, agreeably to what we have before stated in our second position, we find that having by the last alteration obtained the same resistance against *j d* as we formerly obtained against *c d*, this resistance will be productive of a greater propelling effect, arising from the greater inclination of *j d* from *a b*, as compared with the inclination of *c d* from *a b*. By increasing this inclination of *j d* from *a b*, and increasing the velocity with which it moved, we should finally obtain from the employment of a power upon it, such an amount of effective force as would render such an instrument almost perfect, were it not for an inherent defect in the principle of the screw, which I am now about to explain. I here put out of the question all consideration about the difficulty of obtaining the requisite velocity.

From the double velocity with which *j d* was supposed to move, it would necessarily put double the number of particles of water in motion in any given time, to what it would have done if it had moved with only half its velocity. The surface *j d*, therefore, moving with double velocity may be conceived to be similar in effect to two bodies, each like

j d, moving with only half its velocity, in which case *j d*, moving at a double velocity, would essentially expose twice as much surface to the action of the water as it would if it had only been moving with half the velocity. The surface against which the water acts being doubled, any friction which the water would produce against the surface *j d*, at the smaller velocity, will be doubled with the double velocity as regards the amount of surface exposed. Now *j d* doubled, bears to *c d* about the proportion of 5 to 3, in which proportion friction will be increased as regards amount of surface alone; but when we consider that the resistance of the water against both *c d* and *j d* is compounded, partly of the quantity of water put in motion, and partly of reaction from the water, and that in the case of *j d* this reaction is double to what it is in the case of *c d*, and that it is exerted against a surface increased by velocity in the proportion of 5 to 3, we can see some reason for this friction diminishing, to some extent, the useful effect desirable from an alteration in the inclination of the thread, and from an increase of velocity of revolution. Agreeably to what we have just stated, the reaction of the water in the case of *c d* may be considered as 3, while in the case of *j d*, revolving with double velocity, it may be reckoned as 5 (the enlarged surface of *j d*), multiplied by 2 (the double reaction of the water against this surface) or 10; and if we suppose this to be the amount of friction arising from the reaction of the water alone in the two cases of *c d* and *j d*, we shall perceive a rapid increase of friction against an increase of velocity. But besides these causes of friction, there is another arising from the greater perpendicularity of direction of the reaction of the water as regards the plane of motion of *j d*, which will probably be quite sufficient to counterbalance any advantage arising from an alteration in the inclination of the surface *c d*, and in the velocity with which it revolves, whenever a certain degree of inclination shall be exceeded. If we conceive the velocity of revolution to be very great, we may imagine the water to cohere to the propeller, from the want of time to fall off, and the neighbouring particles of water also to so cohere to the water which adheres to the propeller, that we shall have an enormously large portion of the water around the propeller put in motion by the mere effect of friction alone. It is clear that whatever the amount may be of power consumed in thus putting the water in motion by friction, no particle whatever of this can be effective in propelling the vessel.

Friction in the screw in the solid form may be useful in the way of a stop, but when motion, after a rest, is again to be given to this instrument, the friction must first be overcome, before any weight can be raised, for the raising of which the solid screw may be applied. Any one who considers that it is friction alone between a smooth nail and the wood into which it is driven that makes the nail remain in the wood, will form some idea of what the power of friction is. Of all the mechanical powers, there is not one by the use of which more friction and more loss of power is occasioned, than by the screw; indeed, the friction is often as much a motive for using it as the power gained by it at the expense of space: this friction, when the inclination of the thread from the line of rotation of it is little; or when, in other words, the weight to be raised operates upon the threads of the screw nearly perpendicularly to these, is sufficient of itself to more than resist the rotating pressure of the weight; and, in such a case, any addition to the weight has no other effect than that of increasing the friction, or the power tending to produce a state of rest. But the friction, arising from water, it is clear will never act exactly like the friction of a solid, the latter kind of friction will produce a resistance that may be measured, but the other kind is not so easy of estimation; it may, however, be recognized in the retardation of motion, as in the case of water passing through pipes; and, it will be known to exist, whenever a screw propeller, with its threads making nearly a right angle with its axis of rotation, and with the internal parts of the threads cut away, is put into excessively rapid rotation, by the great effect in the disturbance of the water in which it revolves, and by the very trifling effect in the propulsion of a vessel, which it will produce, comparatively with the quantity of power employed.

From what has now been stated, it will appear, that it is hopeless to attempt to eco-

nomically substitute the screw for the paddle-wheel; for, it will be seen, that if the angle, which the thread makes with the axis at the parts about the circumference be about 45°, the loss of power will be very great, and that if we make this angle less, the resistance of the water will be proportionally greater, and, from the manner in which it is given to the screw, will be proportionally less productive of useful effect; and that, if we make this angle greater, though the resistance will be more than proportionally lessened, and the useful effect more than proportionally increased, still any gain, on this account, will be counterbalanced by the loss arising from friction, accruing from necessarily increased velocity.

(To be continued.)

BATCHELORS' BUTTONS.

Sir,—A paragraph which first appeared in a Birmingham paper, has been "going the round" of the various town and country journals, stating that an ingenious Frenchman has invented a button, in which the principle of nut and screw is applied, so that, without a stitch, buttons may be far more securely as well as more speedily put upon clothes than in the ordinary way; and those who have not souls above buttons may if they please have half-a dozen suits of buttons to each suit of clothes, the top being screwed on the shank.

Now, sir, I beg to state that I have *made* and *worn* similar buttons (which I have for a very obvious reason christened "batchelors' buttons,") for above two years; and to submit the result of my experience, for the benefit of our *Brummagem* friends, should they be about to adopt "*Jean Crapaud's*" invention.

That buttons can be more speedily put upon clothes by screwing, than by stitching, is in one sense true; but to make a good job of it, the hole for the button shank (not the usual *button-hole*) should be worked round eylet-hole fashion—especially if a continual change of buttons or of clothes, is contemplated. For although it is hinted, that half a dozen suits of buttons may be adapted to one suit of clothes, it is equally clear that the suggestion may be reversed, and only one suit of buttons employed during a life-time!

As for the greater security, it is all moonshine; I find a most provoking liability to come off; the very act of buttoning and unbuttoning, is a twisting motion of considerable energy, only to be counteracted *by riveting the end of the screw*, which ends the ubiquity of the button.

The button, as well as the internal nut, requires considerable convexity to be given to them, with a good projecting shoulder in the centre, as in some of the best metal brace buttons—out of which, by-the-bye, my screw buttons were made. Some difficulty arises in adjusting the length of the screw-pin, to the exact thickness of the material on which it is to be employed—and also as to whether two or three thicknesses (as in trowser flaps, &c.) are to be accommodated. This I met by making all mine long enough, and cut them off to the proper length after being fixed, but there is a want of neatness in this method, that would militate against the adoption of the article.

After all, I am compelled to inquire, where's all the wondrous merit and advantages of these same batchelors' buttons?

I am, Sir,
Yours respectfully,
WM. BADDELEY.

London, September 2, 1840.

TO MAKE CANVASS WATERPROOF.

Sir,—In one of your late Nos. (884) an inquirer wishes to know if canvass can be rendered waterproof without impairing its pliability. Not having noticed any answer to the inquiry, I will attempt to give a few hints that may, perhaps, be serviceable. Several years ago, I was desirous of having a quantity of pamphlets that had accumulated on my hand, bound, but not being in circumstances to pay a binder conveniently, I made an attempt with my own hands to accomplish the object: but the time required in stitching, fairly mastered my patience, and in order to avoid the irksomeness of stitching, I attempted to cement the backs of the books by applying the following cement, which was used in a warm state, as common glue is generally used. A portion of bees-wax and gum mastic was rendered soluble in soft water, by a sufficient quantity of hard soap, to which was added about an

equal quantity of solution of isinglass. I am not aware if it is known, that size, in an advance stage of decomposition, may be perfectly recovered by a solution of soap? I had made a strong size from glovers' shavings, which stood neglected for some days, till it was found in a rapid state of fermentation, and smelling exceedingly bad, but on adding a solution of white soap, the disagreeable smell immediately ceased, and though exposed to the atmosphere for weeks after, no further decomposition ensued.

To render cloth waterproof, I took some of the foregoing composition, adding about one-half more of the soapy mixture, making about three parts of soap to one of glue. This composition was only soluble in very soft water at a considerably elevated temperature; the cloth was dipped until the pores were filled, then hung perpendicularly, and the surface scraped while yet hot; it was then immediately dipped in a solution of common alum, rinsed in clear water and dried. This prepared fabric I found to resist water to a great extent, though the air would pass freely through it. After it had been in a damp state for some time, it would resist air as well as water; this no doubt arose from the moisture causing the imperfectly tanned gelatine to swell so as to completely close the pores of the cloth. As to the best proportions, and the best ingredients to be used, I can give no further information. As a vehicle for paint, this or a similar composition, offers, several advantages. The paint is applied with great facility, dries remarkably quick, is not liable to change colour, and for ordinary purposes sufficiently waterproof, and may easily be made perfectly so, by previously washing the surface with a weak solution of any metallic salt that would not affect the colour of the paint; sulphate of zinc answers perhaps as well as any other. It is obvious, those colours having less affinity for the alkali than for those greasy materials, could be used.

J.+J.

Goodnestone, August 27, 1840.

TO MAKE LINEN FIRE-PROOF.

A correspondent (F. R. S., page 144,) wishes to know how linen may be rendered incombustible by simple immersion and drying. Perhaps the cheapest and simplest mode is to dip the linen into a solution of equal parts of alum and borax, combined with a little common starch. Linen thus prepared will not flame. The water of crystallization in the alum protects the fabric at a low heat, and at a higher temperature the borax comes into action.

I am, Sir, yours, &c.

J.+J.

Goodnestone, August 27, 1840.

ON BALL COCKS AND BALL VALVES.

Sir,—In No. 887 of your Magazine, is given a drawing and description of an improved ball-valve, and as some reference has been made to the contrivance of mine represented in Number 865, I have thought it proper to make a few remarks on the different communications respecting it. I would have made these remarks at the time, but that I was not able to refer to the vol. containing Mr. Baddeley's article on the subject of ball cocks, being fully satisfied, that if that gentleman had treated the subject with his usual ability, there would be no necessity for my incumbering your pages with any thing more on that subject. Having made a variety of sketches, one of which was exactly on the same principle as that of Mr. Abraham's, given in No. 867, and after weighing the merits and demerits of each, I gave the preference to that with the valve opening outwards, and shutting off the supply at once, and for the following reasons:—I knew from experience, that if a stream of water passed between two metallic surfaces nearly in contact, these surfaces soon became furrowed (particularly so in chalky districts,) so as to render them useless as valves to stop the water. I likewise knew that leakage was frequently occasioned through small bodies, of nearly the same gravity as water, getting between the valve and its seat. I therefore concluded, that valves shut by degrees would be doubly liable to leakage from the same cause, the water being very much wire-drawn before it is entirely shut off. Again, when common cocks, of Mr. Abraham's principle are applied to regulate the supply of water to boilers in a house, the prolonged trickling of the water before it is entirely shut off, is exceedingly annoy-

ing to those of a nervous temperament.* In my ball "valve" the liability to furrow would be very little indeed, and its tendency to leakage from small particles of matter fitting between the valve and its seat would be still less. Mr. Abraham's fears respecting the regurgitation of the water in the pipe, arising from the instantaneous closing of the valve, I suspect would be found groundless. In adapting the valve to open outwards, I had prided myself in having made such an arrangement as to do away all danger from reaction. Though I have said that the ball caused the valve to close instantaneously, it would not be actually so in practice, because, near the point of shutting, the motion of the crank is slow, compared with that of the ball-float at the same time, and combined with the resistance arising from the flow of water, no reaction is likely to take place that would at all endanger the pipe or apparatus. Should a reaction take place, the water would force the valve open for an instant, and after a few pulsations gradually decreasing, the valve would remain perfectly secure on its seat.

Mr. Baddeley's objection to the valve being inoperative unless the balls fall low enough to permit them to assume the perpendicular position, I had foreseen, but did not judge it a material defect; for some purposes to which ball cocks are applied, however, I see the force of the objection. Mr. B.'s other objection, is equally applicable, or rather more so to the Hull cock, and every one having a valve opening inwards, as to mine; in the former, there must be a due proportion between the weight of the ball and its floating quality, and should the ball be of such a weight as to insure the opening of the valve under all circumstances, its floating property would not be sufficient to clear the valve and permit it to fall into its seat; in the latter case, all that has to be attended to, is to adjust the size of the ball, and length of the lever to overcome the resistance of the water on the valve; for when the floating medium is withdrawn, the column of water in the pipe would naturally force the valve open, independent of any assistance from the weight of the ball. The ball-valve contributed by your Liverpool correspondent, is open to the charge attributed to mine by Mr. Abraham, that of checking the current of water in the pipe instantaneously, thereby causing danger to the pipe and cock, from its sudden reaction; this valve, when opened so as to permit a full run of water, the head being considerable, will, undoubtedly, on closing, produce a very injurious effect on the pipe.

J.+J.

Goodnestone, August 27, 1840.

* I had made out a sketch particularly adapted for back boilers, which I meant to have forwarded for insertion in the Magazine at the time I sent the other, and at present the trouble to find it would possibly be greater than it is worth, but as soon as I can lay my hands upon it conveniently it shall be forwarded for your approval, and should you think there is any thing novel in its arrangement, you will favour me by giving it a place in your valuable and continually improving journal.

PADDLES v. SCREW-PROPELLERS—POWERS OF THE "ARCHIMEDES" AND "WILLIAM GUNSTON."

Sir,—In your 885th Number, I find it stated that the *William Gunston*, towed the *Archimedes* astern against her own power, in which statement I see many errors, but as I intend to answer the inquiry of "H." contained in your 887th Number, it is needless to advert to them, as answering the one corrects the other. That the *William Gunston* did tow the *Archimedes* astern against her own power, is a *fact, as I passed them at the time in the river*, and was so much surprised at the circumstance, that I took the trouble to inquire into their respective powers, and found that the two cylinders in the *William Gunston* are each 27 inches diameter, the length of stroke 42 inches, working pressure of steam 10 pounds, paddle-wheels 13 feet 4 inches in diameter, boards 7 feet 9 inches long, and 22 inches deep; vessel 20 feet beam. The *Archimedes* has two cylinders, 37 inches diameter, stroke 3 feet, with square boilers, working steam six pounds on the inch. It will thus be seen by comparing the relative areas of the cylinders of the *Gunston* and *Archimedes*, that the former is little more than ½ the power of the latter. As to the horses power, the tug-boat is, I believe, called 50, the *Archimedes* 85; nevertheless, the *William Gunston did* tow the *Archimedes* astern against the full operation of her screw propeller at a considerable speed. In answer to your correspondent "M.," in your 888th Number, I beg to say, that though the above named trial may "prove satisfactorily

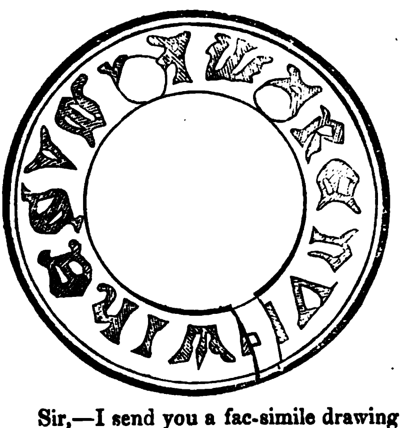
that the screw-propeller has a valuable property, very necessary in swift sailing vessels, which the paddle-wheel, has not," (how comes it, then, that vessels with paddle-wheels run by the *Archimedes*, although she is in possession of the "swift sailing" qualities?) yet I think it proves quite as satisfactorily that the screw would be of very little use to a vessel labouring against a heavy head wind and sea. I would ask what sort of a figure one of the transatlantic steamers would cut, with a screw in her stern, when met by such gales as the *Great Western* and the *British Queen* have contended with? Their "swift sailing" qualities would be of little account then, I guess. Your correspondent further says, that "to assist in forming any idea of the powers of these two boats they should have tried their speed in a race." This I can tell him was done, and that the *William Gunston* beat the *Archimedes* hollow.

I am, Sir, your obedient servant,

W. B.

London, August 17, 1840.

CURIOUS ANTIQUARIAN RELIC.



Sir,—I send you a fac-simile drawing of a ring, which was dug up in a field near the market town of Hitchin, in Hertfordshire. If you should consider it worthy a place in your journal, some of your readers may be able to interpret the characters, and impart some information relating to the purposes for which it was applied.

It is about the $\frac{1}{16}$th of an inch in thickness, and appears to be made of brass.

Yours respectfully,

CAROLUS.

Hitchin, August 8, 1840.

MR. ARDASEER CURSETJEE, C. E.

[From a Correspondent.]

Mr. Cursetjee, whose appointment to be Superintendent of the Bombay Steam Marine Establishment we had lately the pleasure of announcing, is a Parsee gentleman, and belongs to the Loujee family which is well known in this country, and is one of the first in India. For more than a century it has been in the employment and confidence of the British Government. It was an ancestor of Mr. C.'s who established the Government Dockyard at Bombay, and his father and uncle are at present master shipwrights in the East India Company's service.*

Mr. C., himself, entered the same service in 1822, and has remained ever since attached to it. About 1830, he was promoted to the charge of the Goverment yard at Mosuquon; where some very fine vessels have been built under his immediate superintendence.

Soon after this Mr. C. began to study the steam engine and devoted much of his time to marine engineering. He made (entirely unassisted) a small steam engine of about one horse power, and endeavoured to explain the nature and powers of steam to his countrymen. For the purpose of accomplishing this object still more effectually, he was induced to go to the expence of having a marine steam engine sent out from England, and he, himself, built the boat and fixed the machinery in it. This was the first private steam vessel in Bombay, and, at that time, the East India Company, themselves, had only one vessel there, viz. the *Hugh Lindsay*. Mr. C., with great trouble, brought up a native to manage his steamer, and this man has driven and managed the engine for upwards of five years, and kept it in good order without the assistance of any European whatever, and without a single accident or injury to the engine.

In 1834, Mr. C. introduced gas-light into Bombay, entirely at his own expence, having lighted up his house and garden with gas, and left them open for public inspection during several months. As this was the first gas-light ever seen at Bombay persons came from a distance of many hundred miles purposely to view it. Mr. C. experienced great difficulty in constructing the gas apparatus, as there is no foundry or other means of getting work done in proper style in Bombay. He had thus to be at the expence not

* The Loujee family is the head of the Parsee Caste in India, and its senior member always presides over their Puncheet or Synod. The late head of the caste, Homayee Bomayee, was a partner in the well known firm of Forbes and Co. of Bombay, and his brother, Pestayee Bomayee, was a partner of Bruce, Fawcett and Co. of Bombay. The present head of the caste is Nowayeejomaltjee, the Head Naval Architect in Bombay, and uncle to Mr. Ardaseer Cursetjee.

only of manufacturing gas-light, but also all sorts of tools, &c. &c. for making tubes, cocks, &c. &c.

After some time education began to spread in Bombay, and professors of different branches of knowledge were sent out from this country to aid and encourage the natives. Mr. Cahban, the Professor of Mathematics in Elphinstone College, became acquainted with Mr. C., and perceiving him to be so anxious to improve his countrymen and so well informed upon general mechanics, he was induced to apply to the Bombay Government to allow Mr. C. to assist him to teach the natives, and in trying experiments in different branches of mechanics and chemistry. The Government readily complied with this request, and Mr. C. was directed to assist Mr. Cahban as far as lay in his power without interfering with his duty.

The progress of steam navigation in India was at first greatly impeded by the difficulty of executing there any repairs required in the engines. It was found that European engineers could not generally stand the climate, and those who could were not to be depended on for steadiness and sobriety. It became, therefore, an object of great consideration to have the necessary means for doing repairs at Bombay, and Mr. C. was commissioned to proceed to England for a short time to obtain every information necessary for the purpose and to make himself acquainted with all new improvements in marine engineering.

Mr. Cursetjee has, accordingly, been for nearly twelve months at the manufactory of the Messrs. Seward's and Capel and has made such progress that those gentlemen, as also Messrs. Maudsley, Sons, and Field and Mr. Robert Napier, have given him the most flattering testimonials of his acquirements. Since Mr. C.'s residence here he has been also admitted a member of the Institution of Civil Engineers. For his appointment to the Bombay Superintendentship he is, we understand, chiefly indebted to the Chairman of the Court of East India Directors, Wm. Bailey, Esq., to whom great credit is due for being the first to recognize and advocate the claims of the natives of India to an equal participation, with all other classes of Her Majesty's subjects, in the patronage and favour of the public authorities. We trust he may long continue to enjoy the approbation which such liberal conduct must insure.

We cannot resist the temptation we feel here to remark, that for many years past, while the natives of India and our other valuable and important colonies and plantations abroad, have had no helping hand held out to them to raise them in the scale of society, foreigners of all climes and countries have been received into this country with open arms. Our dockyards have swarmed with them—our manufacturers have been persuaded to receive them—even our ships of war have had them by dozens on board, and British captains ordered to teach them the art of navigation *and war*. It cannot be out of the recollection of many of our readers, that between the years 1808 and 1820, scarcely a man-of-war went to sea without some half dozen Russians on board. These men were taught all that a British sailor could teach them, and now they are ready, *out of pure gratitude*, to take and burn our ships and wrest from us our colonies. The French, too, have always had free access to all our dockyards, to examine and learn all the improvements of the age; and have also had free permission, whenever they wished, to examine the draughts of our ships of war at Somerset House. Egyptians also still swarm in our Government dockyards, and the master builders have especial instructions "to teach the young idea how *to shoot*," though, at this very moment, the ruthless barbarian whom these men acknowledge as their lord and master, is moving heaven and earth to promote the interests of France to the entire annihilation of British influence in the Mediterranean.

It is to be hoped the eyes of the British nation are now opened to the folly and absurdity of this spurious species of liberality. Let our Government show but half the favour to the natives of India that they have shown to their sworn enemies, and the energies of a grateful population will be exerted for them in time of peace as well as in the momentous event of war. Encourage by all means the natives of our Indian possessions to come to this country; teach them the arts of peace as well as those of war; and then, when the time arrives that the craftiness of our *dear kind friends*, the French, Egyptians, and Russians, shall form a league against us, we may be able to raise an army and a fleet in our Indian possessions inferior to none in the world.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

RICHARD EDWARDS, OF FAIRFIELD PLACE, BOW, DEALER IN EMERY CLOTH, *for improvements in preparing and combining of materials used in lighting or kindling fires.*—Enrolment Office, August 29, 1840.

This patentee states that, in the ordinary bundles of fire-wood, there is not sufficient ventilation to allow it to burn comfortably in the close form of a bundle; he, therefore, proposes to obviate this difficulty, by the introduction of cotton, rope, paper, and such like matters, so as to leave a freer space between each piece of wood forming the bundle, thus

forming what he is pleased to call a "Ventilated faggot," the combustibility of which may be still further increased by having its ends dipped into a bath of melted pitch, tar, resin, sulphur, or other inflammable matter!

As economy compels us to divide our bundles of fire-wood, we have not experienced any of the inconveniences which Mr. Edwards has undertaken to remove under the licence of letters patent; nor can we say that we like the look of his "faggots," which smell too much of "Guy Fawkes" for our tastes. We commend him to the very particular attention of the fire insurance offices!

JOSEPH SHORE, OF BIRMINGHAM, MERCHANT, *for improvements in preserving and covering certain metals and alloys of metals.*—Enrolment Office, September 3, 1840.

This patentee claims exclusive right to a mode of applying a permanent covering of copper or of nickel, by a galvanic process, to articles of wrought or cast iron, tin, lead, and copper, and of alloys of such metals, such covering acting as a preservative to some of those metals, and in other cases giving them a superior surface. The patentee does not limit himself to the precise mode in which this is to be accomplished, but describes the following as a convenient method of effecting the same. An open vessel of sufficient capacity is divided by a partition of some porous material; in one division water is placed slightly acidulated with sulphuric acid; the other compartment is filled with a solution of salt of copper. A surface of zinc is placed in the diluted acid, from which a copper wire proceeds into the copper solution where the article to be coated is also placed. If the article of manufacture is large, it is to be operated upon singly, but if small, several may be treated together. But it is essential the goods should present a clean metallic surface; such cleansing being effected by making them red hot, when the material is of a character not to be injured by such process.

JAMES HORNE, CLAPHAM COMMON, ESQ., *for improvements in the stuffing boxes of lift pumps.*—Enrolment Office, Sept. 3, 1840.

These improvements consist in the application of two cupped leathers to the purpose stated, in the following manner: the stuffing-box consists of a metal collar and cap, each having a projecting ring or shoulder on the inside; two pieces of leather are blocked into the form of cones with a horizontal base, having an aperture at the apex just large enough to receive the piston-rod; one of these cones is placed upon the piston-rod with its apex downwards, its base resting upon the shoulder in the collar of the stuffing-box; a metal disc is then slipped on to the piston-rod, and afterwards the second leather cone with its apex upwards, its base resting upon the metal disc; the stuffing-box cap is then put into its place, and screwed down tight. The metal disc becomes a guide for the piston-rod, while the pressure of the fluid below, and of the air above, upon the external surfaces of the two cupped leathers, keeps all tight. The arrangement is doubtless a good one, but we think the patentee would hardly have gone to the expence of a patent, had he been acquainted with the more beautiful, as well as more ingenious mode of constructing stuffing-boxes, employed by Bramah in his hydraulic press half a century ago; and which has proved efficient under greater pressures than a lift pump can possibly be exposed to.

JOHN SYLVESTER, OF GREAT RUSSELL STREET, ENGINEER, *for improvements in the construction of doors and frames, for closing the openings of fire-places, ash-pits, flues, chimnies, and certain retorts.*—Enrolment Office, September 2, 1840.

These improvements consist for the most part in various modes of constructing doors for the purposes enumerated, so that their own weight, being supported from above, shall effectually close them; a sliding motion being also given them for the purpose of clearing them of any incrustation, &c., liable to collect on their surfaces and likely to interfere with their efficient closing. In the first plan which accompanies the specification, a cast iron door-frame is fitted to the brickwork of the furnace, about twice the width of the opening to the fire-place, which opening is situated at one end of it; the plane surface of the fire-place is elongated by two rails running the whole width of the casting. The door is suspended from a horizontal rod, the same length as the rails, by two links hinged to about the middle part of the door, so that it may press with nearly equal force on the surface of the opening. This door may be opened by lifting it up, or by sliding it horizontally. Another modification shown consists of a door sliding vertically, with a chain passing over two pullies to a counterweight. A third arrangement is a door furnished with two hooks, by which it hangs from a ledge along the upper part of the door-frame, having the same motions as the first-mentioned. Finally, the construction of a retort-door is shown, wherein the retort terminates in a projecting vertical face, closed by a door, which is suspended by links from journals placed behind that vertical face, so arranged as to close the door with considerable force by the action of gravity alone. To facilitate the opening of doors of this kind, a counter-weight is attached by a chain to the front of the door. The claim made is, for the invention of a door suspended in such a manner that the tendency of the door to fall with its centre of gravity immediately under its point of suspension, shall cause it to press with

sufficient force to keep it closed without the necessity for any latch or other fastening; such doors having liberty to slide to a greater or less extent, so as to clear the face of any extraneous matter that may adhere thereto.

DEPARTURE OF THE "VERNON."

On Wednesday last, the 9th instant, the *Vernon* East Indiaman, of 1000 tons burthen, left Blackwall, in command of Capt. George Denny, on her second voyage to Calcutta, propelled by the auxiliary steam engine fitted to this vessel by Messrs. Seawards and Capel, a detailed account of which appeared in our 890th number, when announcing the sailing of her sister vessel, the *Hardwick*. Mr. Green, the spirited owner of these fine vessels, Mr. S. Seaward the engineer, and a large party of nautical and scientific gentlemen, accompanied the vessel about ten miles beyond Gravesend, where she was taken by the power of her engines, with very little assistance from the canvas. Her progress down the river was most majestic, and she passed some much smaller vessels, that were being towed down by tug-boats greatly her superiors in point of engine-power. Nothing could surpass the smooth and easy motion of her machinery, which produced no noise or tremor by which the presence of such an agent on board could have been detected, while, at the same time, the complete efficiency of the power for the purpose intended, was satisfactorily demonstrated. The *Vernon* has one cylinder of thirty inches diameter, working horizontally, making a three-feet stroke; the paddles are fourteen feet in diameter; the steam is worked at four pounds pressure, and the power is reckoned to be thirty horses. The whole of the heated surfaces are coated with two thicknesses of patent felting, enclosed within deal casings, so that no heat is transmitted through these excellent non-conductors, by which means there is a great economy of fuel, and the vessel is kept cool and comfortable, even in the engine-room; while the fires between decks are highly advantageous in ventilating that part of the ship. For going into, or coming out of port—for contending with light or adverse winds—or surmounting the still more dreaded calm—this small engine has shown itself amply sufficient. We may remark, that the aid of steam power seems to be most highly prized by the seamen, in moments of calm; that fearful state of existence, most picturesquely pourtrayed by Southey in his "Ancient Mariner"—but never to be adequately conceived by any who have not experienced its direful effects. It is at such times, when "death-like silence reigns," and "all the air a solemn stillness holds," that vessels equipped like the *Vernon*, may most truly be said "to walk the waters like a thing of life."

The very motion of the engine, and the rotation of the paddles would go far to dispel the listless *ennui*, and horrid gloom of a calm, even though no progression resulted from their motion. This relief, however, is highly enhanced by the knowledge, that every turn of the paddles advances them so much nearer towards, "the haven where they would be."

NOTES AND NOTICES.

Brickmaking in India.—Nothing I have ever seen has at all equalled the perfection of the early brickmaking which is shown in the bricks to be found in these ruins (ancient tombs near Tatta); the most beautifully chiselled stone could not surpass the sharpness of edge and angle and accuracy of form, whilst the substance was so perfectly homogeneous and skilfully burnt, that each brick had a metallic ring, and fractured with a clear surface like breaking freestone. I will not question the possibility of manufacturing such bricks in England, but I much doubt whether such perfect work has ever been attempted.—*Dr. Kennedy's Campaign of the Indus.*

An enormous organ is now in the course of erection in the Abbey of St. Denis. It contains about 6,000 pipes, amongst which are some measuring 52 feet, and weighing 12,000lb. This magnificent instrument is nearly completed.

The Nassau Balloon.—Mr. Green, who is now nearly recovered from the effects of the injuries received in his late descent, is at present exhibiting his "monster balloon" inflated with atmospheric air, in the Corn Exchange, Norwich, from which place, at a convenient period he contemplates making an aerial trip on an extended scale, both in point of elevation and distance. The dimensions of this balloon are as follow:—Diameter 51 feet, height 68 feet, exclusive of the car; with the car attached 80 feet; circumference 159 feet. To inflate it properly, upwards of 70,000 cubic feet of gas are required. The car is capable of conveniently holding 12 persons. The weight of the balloon's contents of atmospheric air at the temperature of 60°, with the barometer at 30 in. is .... lbs. 6375

The weight of a similar quantity of carburetted hydrogen gas, spe. grav. 355 is 2285

The ascending power is consequently...... 4090

Making the total as above............ 6375

Napier's Patent Shot Machine.—The Board of Ordnance have determined upon employing Napier's machine for making balls by compression (described at page 239) at the Royal Arsenal, Woolwich; it is to be worked by steam, as also the turners and borers of cannon. At present, the same system as was in vogue forty years ago, is used in the boring of large guns, horses being employed as the moving power. This alteration will relieve about ten artillerymen who have charge of the horses employed in this duty.

The "Stromboli" Armed Steam-vessel, Commander J. W. Williams, under orders to proceed immediately to the Mediterranean, is a splendid steam-vessel constructed last year for service in the East Indian seas, and for that purpose was armed with six guns of large calibre, carrying balls of 105 lb. weight a distance of three miles with tremendous effect. These pieces of ordnance weigh about 65 cwt. each; they are constructed on a new principle, which renders them safe, and easily managed on board of steam-vessels, where the concussion from those formerly used was apt to derange the machinery. Before being adopted, these guns underwent severe tests last year, by the detachment of Royal Artillery stationed at Deal, and in vessels in the Downs.—*Times.*

Singular Obituary. — Died on Friday last, the "London and Leeds Mail-coach" in the 56th year of its age. It first commenced running (through Nottingham) on the 26th July, 1785, and ceased on the 28th August, 1840. The immediate cause of its dissolution is the spread of railways.—*Lincoln Gazette.*

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 893.] SATURDAY, SEPTEMBER 19, 1840. [Price 6d.

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MR. SAMUEL SEAWARD'S DOUBLE ARM PISTON STEAM-ENGINE.

Fig. 1.

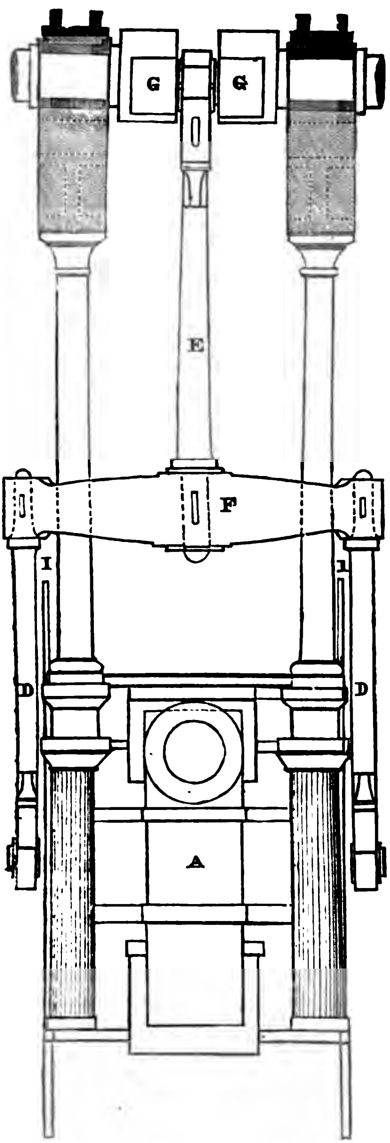
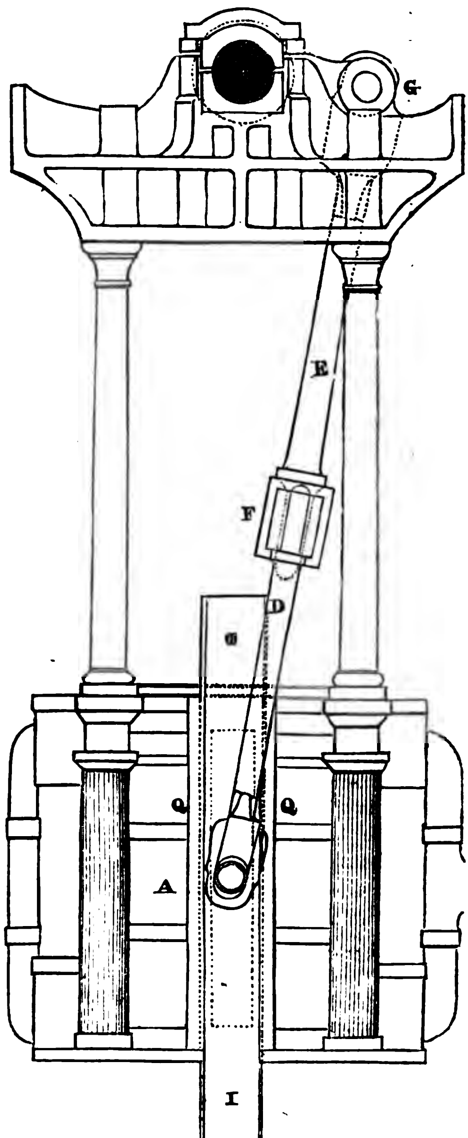


Fig. 2.



MR. SAMUEL SEAWARD'S PATENT IMPROVEMENTS IN STEAM ENGINES AND IN THE APPLICATION OF STEAM ENGINES TO PROPELLING PURPOSES.

[Patent Dated March 17, Specification Enrolled September 17, 1840.]

The improvements included under this patent are six in number, and bear all the promise of great practical utility. We have not room this week for a description of more than the first of these improvements; but we shall give the remainder in our next and succeeding numbers.

The first improvement is described in the specification as consisting in attaching to the piston of the steam cylinder two arms which project through the des of the cylinder, and work up and down therein through steam and air ight grooves, and in conveying, by means of a connecting rod attached or jointed to the said arms, the motion of the piston directly to the beam or cranks of the engine "*without the intervention as usual, of a piston rod and parallel motion, or any similar contrivance.*"

Figs. 1 and 2, are front and side elevations of the cylinder and some other parts of a steam engine on this improved plan of construction, in which the power is communicated directly from the piston to the cranks.

Figs. 3 and 4, are cross sections of the cylinder.

Fig. 5, a vertical section of the cylinder and piston; showing, more distinctly than is done in the other figures, the construction of the grooves, and the manner in which the arms of the piston are made to move up and down therein, without any escape of steam or admission of air taking place.

A in all the figures is the steam cylinder; Z Z are the side grooves, which do not extend the whole way from top to bottom, but are of a length only equal to the length of stroke of the piston, and of one of the sliding blocks (M) afterwards described. These grooves should coincide exactly with a straight line, drawn across the centre of the cylinder, and their faces should be planed or wrought perfectly true and parallel with the axis of the cylinder. Q Q are flanges which form external faces to the grooves Z Z, and are cast with the cylinder. B is the piston rod; C C, the arms of the piston, which project through the sides of the cylinder, and work up and down in the grooves Z Z. M M are two oblong sliding blocks, with circular apertures in the centre, which are passed over the arms C C, and fit into the grooves Z Z, the apertures and external faces of the blocks being all planed and ground true, so that by the exact fittings of the arms to the circular apertures, and of the external faces of the blocks to the faces of the grooves Z Z, any passage of steam from the upper to the under side of the piston, or *vice versa*, may be prevented. I I are two external slides, which are also passed over the arms C C, fit close to the flanges (Q Q) of the grooves Z Z, and work up and down with the arms C C; being of such greater length than the grooves Z Z as to close them completely throughout each stroke of the piston. The faces of the flanges Q Q, and of the slides I I, are to be planed and ground so true as to fit very closely the one to the other. L L are two strips of iron with bevilled faces, which for the sake of additional security against leakage, are screwed on the faces of the flanges Q Q, and bear against the sides of the two slides. E (fig. 1 and 2) is a connecting rod with a cross head F, and two legs D D, which are attached to the piston arms C C, by means of which forked-connecting rod, the motion of the piston is conveyed to the cranks G G.

Should the sliding blocks M M, and external slides I I, work less true from use, or should it be deemed advisable to provide against their being impaired by use, Mr. Seaward recommends that they should be packed with hemp, by forming grooves on their faces, and filling these grooves with ordinary hemp packing.

Fig. 3.

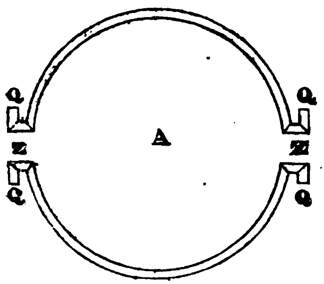


Fig. 4.

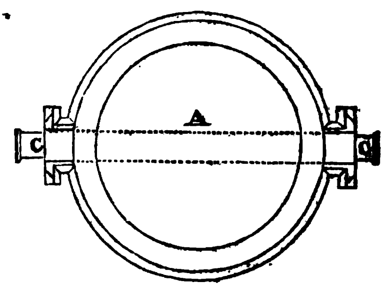
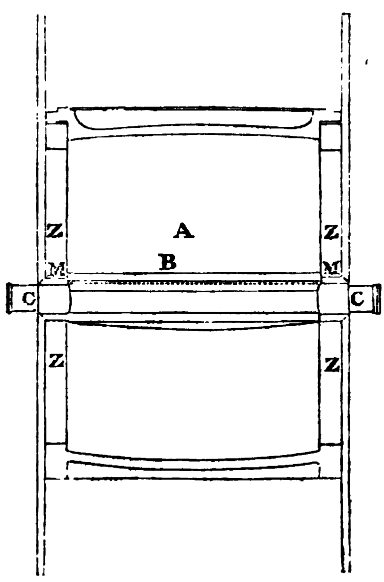


Fig 5.



ON VACUUM GAUGES.

Sir,—A great many papers have appeared in the *Mechanics' Magazine* relative to surface condensation, a large portion of which I have not seen, and not having the means at hand, I will without reference to any one of them, endeavour to give as popular a view of the subject, as my humble abilities will permit, in the course of two or three short papers—the first on vacuum gauges, the next on this system of condensation, and a third probably on the important consequences which will most assuredly follow its adoption.

On the Barometrical Vacuum Gauge.

This gauge, as its name implies, and the common barometer act as is well known, on the same principle, viz.: by the pressure of the atmosphere supporting a column of mercury in a vacuum either perfect or partial. Now, the top of the barometer tube is hermetically sealed, and the space above the mercury therein is termed the Torricellian vacuum, from its discoverer Torricelli, and which is the only perfect one known. But the top of the gauge-tube is open, and connected in a suitable manner to the chamber of the condenser; consequently, in proportion to the perfection of the vacuum effected therein, so will be the height of the mercury in the gauge; the "difference" between it and the column in the barometer at the time of observation, enables us to calculate the true value of the vacuum obtained. For, from the varying pressure of the atmosphere, a gauge may show 27 inches of mercury at one time, and 28 or 29 at another, yet the vacua may in no wise differ, as this may be occasioned solely by atmospheric changes, not at all affecting the value of a vacuum. Hence, the terms usually employed to express its quality, such as 27 inches of mercury, 27½-28, or whatever it may happen to be, convey no definite idea of its real value, unless the height of the mercury in the barometer be noted at the time of taking the observation, to enable us to institute a comparison and discover the difference.

The more simple, however, and therefore the better mode, in my humble judgment, would be to express the quality of a vacuum at once by the "difference" between the two mercurial columns, calling such difference, "*The difference of Vacua.*" Thus, supposing a vacuum obtained in the condenser of 28 inches, as it is termed, and the barometer to stand at 30, it is evident that 2 inches of mercury would be the amount of "difference" between the Torricellian and the condenser's vacuum, (if it is not a misnomer so to term it.) Now as 2 inches may be considered for all practical purposes in so small a range as equivalent to one pound, or one ounce for every eighth, we see in an instant that the permanent resistance offered to the piston by this vacuum, is one pound to each square inch of its area, which appears to me more definite and intelligible than the common method.

Of Bedwell's Vacuum Gauge.

This elegant little instrument is constructed on the principle of the barometer, but shortened in the tube to about 8 inches, as a greater length would be neither convenient nor useful; this tube *is* hermetically sealed and completely filled with mercury, but instead of the cup at its base being exposed to the pressure of the atmosphere, when in action, the whole, including its graduated scale, is inclosed by an inverted glass cylinder of about 2 inches diameter, as shown in number 874 of your Magazine. The *chamber* formed by this covering is connected to that of the condenser; consequently, when the engine is set to work, the surface of the mercury in the cup is relieved of the pressure, maintaining the column in the tube equal in amount to the degree of vacuum obtained in the condenser; the mercury of course falls, and a Torricellian vacuum is produced. Thus, while the common gauge requires a reference to a barometer to ascertain the value of its indications, this complete little instrument presents the vacua always in a state of comparison, the height of the mercury showing the "difference" or excess of pressure in the condenser above the perfect vacuum in the gauge tube.

The *British Queen's* vacuum was said, if my memory serves me to be something like 30½ inches by this gauge, but it is manifest, unless we know the "*assumed*" value of a Torricellian vacuum, from which point I apprehend the scale must have been graduated, we can form no correct estimate of the vacuum in question.

I will therefore recommend, as in the former case, the simply taking the height of the mercury in the tube, and term it likewise "*The difference of Vacua,*" and estimate as before the resistance to the piston for each square inch of its area at one ounce for every eighth of an inch in the height of the column.

I remain, Sir,

Yours respectfully,

ALPHA.

Limehouse, September 1, 1840.

BEDWELL'S MARINE BAROMETER.

Sir,—Nothing but the paramount importance of the subject could have induced you to admit, or me to add to the

lengthened discussion in the *Mechanics' Magazine*, of the comparative merits of Mr. Samuel Hall's patent condensers, and the common ones. I should not indeed have troubled you with this communication, had it not appeared to me, by the silence of Mr. Hall, Mr. Oldham, and Mr. Peterson, (the latter of whom is departed hence in the *British Queen*,) that they decline replying to the letter from "V. L. E." of the 3rd inst., of "R. S. M." of Dundee, of the 10th inst., and several others in the *Mechanics' Magazine*.

It appears to me that the nature of Bedwell's barometer or vacuum gauge, and the difference between it and the atmospheric, or (as "R. S. M." calls it) *long* gauge, has not at all been understood by the several writers above mentioned, and that consequently, when speaking of the vacuum indicated by them respectively, great misunderstanding and confusion have arisen. It is principally with a view to explain the difference in the operation of these two gauges that I now address you. Bedwell's vacuum gauge simply shows the amount of vacuum produced by a condenser, without any relation whatever to the state of the atmosphere; whereas the atmospheric, or long gauge, indicates both the state of the vacuum and that of the atmosphere united together, but not separately. I beg to refer "V. L. E." "R. S. M." and others, to the drawing and explanation of Bedwell's gauge inserted in your 874th Number, by which they will see that it is graduated like the atmospheric or common barometer up to 31 inches of mercury, and that consequently, if a perfect or Torricellian vacuum were produced by the condenser in the glass B, B, containing the gauge, the mercury would be raised in the tube to 31 inches, or to a level with the mercury in the glass bulb A. It will also be evident, that if the vacuum raise the mercury only to 30 inches, the vacuum will be 1 inch from being perfect, if to 29 inches only, then it will be 2 inches below being perfect, and so on, according as the vacuum is still further from perfection. The advantage of Bedwell's gauge is, as before stated, that it at all times shows the comparative vacuum produced by all condensers, without being interfered with or influenced by variations in the atmosphere. This is indeed a great advantage possessed by it over the common or long gauge, the mercury in the latter being affected by two causes instead of one, viz.: not only by the degree of perfection of the vacuum, but by the state of the atmosphere, so that unless the engineer has an atmospheric barometer at hand as well as the long gauge, he cannot tell how much the rise or fall of the mercury in the latter is caused by the imperfection of the vacuum, (which alone is the object of his cares and attention) and how much by the state of the atmosphere, with which he has nothing to do, and over which he has no control. It may, perhaps, at first sight be urged that as the state of the atmosphere is not indicated by Bedwell's gauge, it is not so efficient as the common gauge, but this is not the case, for by reference to the atmospheric barometer, and by deducting the amount at which the mercury in it stands below the highest point of graduation (viz., 31 inches) from the column of mercury shown by Bedwell's gauge, the height of the column of mercury will be found to be the same as that shown by the longer common gauge. If I have succeeded in my endeavour to make the difference of the operation of Bedwell's and the common vacuum gauge understood, I think the writers in the *Mechanics' Magazine* to whom I have alluded, will perceive (and have the candour to admit) that the *apparently* contradictory statements made by Mr. Hall to Dr. Lardner, and by Mr. Peterson in the *Mechanics' Magazine*, respecting the vacuum shown by the two kinds of gauges, may be explained and reconciled without having recourse to charges of fraud and deception against those gentlemen. However, lest that should not be the case, I will point out to those writers that there is no contradiction in Mr. Hall's statement to the Doctor, respecting the production of a vacuum equal to a column of mercury of 28 to 29½ *inches according to the state of the atmosphere*, and the testimony of Captain Roberts, Mr. Peterson, and others, to the production of a vacuum equal to a column of mercury of from 29½ inches and 30½ inches *by Bedwell's barometer*. It is clear that Mr. Hall referred to the atmospheric or long gauge, by alluding to the state of the atmosphere, and it is equally clear that

Mr. Peterson, &c., referred to Bedwell's, the principles of which he no doubt gave the readers of the *Mechanics' Magazine* the credit for understanding, this gauge being generally used in the Clyde, and by some engineers in London. To elucidate the matter further, I will show that the same vacuum may be indicated by 28 inches of mercury by the common gauge, if the atmospheric barometer be very low, and by 30½ inches by Bedwell's gauge. We will suppose the vacuum to be ½ inch of mercury less than a perfect vacuum, and that the atmosphere is in a state (although that is rarely the case) to support only a column of 28½ inches of mercury, being 2½ inches below the highest point of the graduation of the atmospheric barometer: this 2½ inches being deducted from 30½ inches, shown by Bedwell's gauge, will give the remainder of 28 inches, as shown by the common gauge. I repeat that (as this explanation shows) the long gauge indicates both the imperfection of the vacuum and the state of the atmosphere, and that Bedwell's gauge indicates only the former, and that for the state of the atmosphere, referenbe must be had to the atmospheric barometer. I have been thus minute, and perhaps guilty of tautology, in order that no further erroneous or calumnious statements may find a place in your Magazine, owing to parties reasoning and drawing conclusions from false premises, which I am persuaded every one must admit has hitherto been the case, who, after considering the above explanation, will take the trouble of perusing the letters which have been previously written and published in your pages. Should this letter be deemed worthy of a place in the *Mechanics' Magazine*, I will next week endeavour to clear away some other mists which have distorted the vision of some of your correspondents when looking upon this interesting subject, and has obscured beauties which would have been discovered, if viewed through a less clouded medium.

I am, Sir, your obedient servant,
HONESTOMETER.

London, September 4th, 1840.

IMPROVEMENTS IN SEWERS.

Sir,—In the capacity of surveyor of roads, my attention has been forcibly drawn to the great improvements which have been made within the last few years in the sewers of the Holborn and Finsbury divisions. I allude more particularly to the cleansing of sewers by flushing with water, by means of apparatus fixed in the sewer, by which the accumulation of foul deposit is prevented, and the disturbance of pavements avoided; and to the formation of side entrances to sewers, which gets rid of the necessity of breaking up the roads and pavements, in order to obtain access to them. These and many other improvements have been going on unnoticed by the public; it is because they are out of sight, I suppose, that they are lost sight of and not appreciated. As nothing, however, is so conducive to the health of this large metropolis as a good sewerage, so there are few public improvements more worthy of being recorded in your valuable Magazine. The merit of those I have here brought under your attention is, I believe, solely due to Mr. Roe, the talented engineer, under whose superintendence the sewerage of the districts in question is placed.

From yours respectfully,
C. BALDWIN.

NEW MODE OF WORKING THE SLIDE-VALVE OF STEAM ENGINES.

Sir,—There are many different modes of working slide-valves, but the common way of working the slide-valve of a steam engine is by an eccentric tumbler. The eccentric tumbler is well known by every engineer; it produces a beautiful and easy motion, but not exactly the motion required. I will here point out some of its faults, as applied to a locomotive engine, which are the same with all other engines.

A slide-valve worked by an eccentric tumbler is continually moving; its motion is very irregular, being much slower in one part of the stroke than another. Now suppose the piston is at the end of the cylinder ready for making a stroke, the valve will be shut; when the engine is put in motion, the valve will gradually open until the piston arrives about the middle of the cylinder, when the valve will be wide open; so you see that the steam does not get a full open passage into the cylinder until the piston is half-way down.

The makers of locomotive engines, generally give their valves what is called "the lead," by setting the eccentric tumblers a little before the cranks. This is done for the sake of getting a full supply of steam sooner; it is said to answer very well, and I do not doubt but it does. Still it looks very singular to cut the steam off from one side of the piston, whilst in motion, and put it on the other; but such is the case with all engines which have "the lead" thus given to the valves, providing the valves are made, as they frequently are, without lap, similar to A fig. 3.

Those who give lead to their valves by the eccentric tumblers, are obliged to put to their engines two extra eccentric rods and tumblers to reverse the motion of the engine, unless they leave the tumblers to work loose upon the shaft, which is but very seldom the case. I shall now, with the assistance of the accompanying sketches, endeavour to explain a new method of working the slide-valves of a locomotive engine, which will do away with the great bundle of eccentric rods and tumblers, that takes up so much room.

You must first understand, that the valve belonging to the one cylinder is worked by the piston-rod of the other. A, fig. 1, is a piece of wrought iron, which is made fast to the piston-rod cross bar I; its length is rather more than half the stroke of the piston; its breadth is not very particular, unless all the lengths of the levers connected with it are determined. B is an equal-centred lever, set so, that either the one end or the other will always rest upon some part of A. At the other end of the same spindle as B is upon, there is another equal-centred lever C, which is connected to the valve rod by the reversing-rod D, the other end of which is made similar to fig. 2, and is lifted up or let down, from one end of the lever C to the other, by a rod attached to it at F, and by means of the forks G, H, draws the valve to its proper place, and reverses the motion of the engine whilst in any part of the stroke.

By attention to fig. 1, it may be seen that the valve would be shut when the crank, connected to the piston, was at S, as the ends of the lever B, would then rest upon A, in the points shown by the two small circles. Now, suppose the crank to be turned in the direction shown by the arrow, the valve will gradually open until the crank gets to W, when the valve will be wide open, where it will

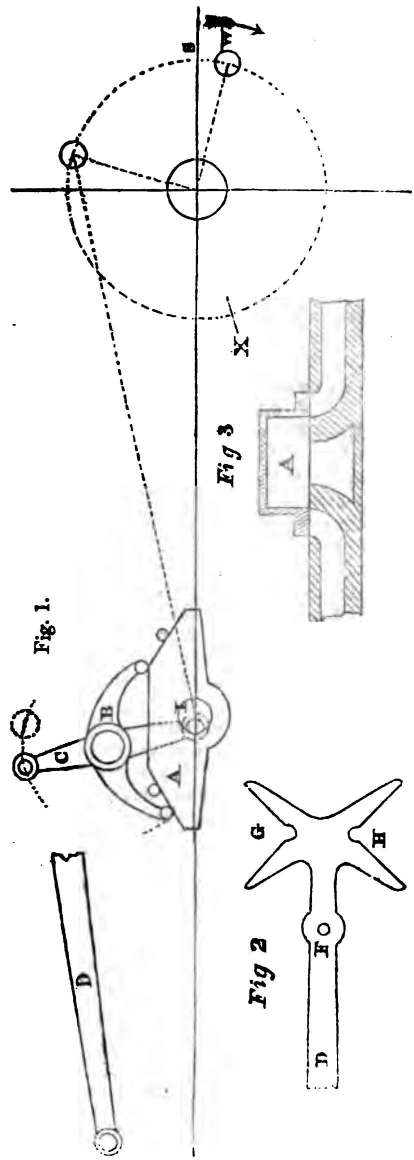


Fig. 1.

Fig 2

Fig 3

remain until the crank gets to X, at which time the valve will begin to close; so you see, that, by working the valve in this way, we keep an open thoroughfare

into the cylinder for nearly the whole length of the stroke of the piston, as may be seen by the situations of the crank (W, X.) I should recommend the valves worked in this manner, to have a little lap; a valve is said to have lap, when the whole length of it is rather more than the distance between the two insides of the steam passages. I should also recommend the inside of the valve to be made rather longer than the distance between the two insides of the steam passages, so that the steam may begin to escape from the cylinder a little before the crank gets to the centre.

Yours respectfully,
JOHN CHARLES PEARCE.
Leeds, August 17, 1840.

ON LATENT HEAT—CIRCULATION OF THE BLOOD, ETC.

Sir,—For the complimentary manner in which "A. Y." has expressed his opinion on the several letters which have appeared in your Magazine, on the art of brewing, &c., from me, I beg to tender him my best acknowledgements. But, it appears that my *debut* in the lists of discussion on higher-ground, has not called for the same commendation from him; and, as roses do not grow without thorns, therefore, in accepting of the one, I must put up with the inconvenience of the other.

In entering upon the arena, to sustain a conflict of opinion, upon the subject started by Mr. Prater—" On inherent activity as a property of the particles of matter," I was prompted to the warfare with a view to endeavour to maintain inviolable the ancient doctrine of " the inertness of matter, and to point out the fallacies of the new doctrine, of its inherent activity as attempted to be inculcated by Mr. Prater," and how far I succeeded in accomplishing such object, I must leave to the decision of your readers; and to expect to come off without blows and scratches in the engagement, I never did. It appears that neither of us have conducted ourselves well in the engagement in the estimation of "A. Y." and that in attempting to dispel one error, the tendency of my exertions has been to inculcate more.

In furnishing the atomic theory contained in my letter dated May, inserted in your number of the 6th of June last, in order to be able the better to endeavour to refute the opinions sought to be inculcated by Mr. Prater, I endeavoured to effect it with as much brevity and perspicuity as possible, and I was not aware that I possessed the ability to set forth any subject " with a learned array of abstruse expressions," until so informed by "A. Y." But it appears that their abstruseness was not equal to his sagacity, since he discovered that such theory, " differs in no one particular from what has been long before the public," and therefore, what was so plain and evident to him, might be equally so to others, unless he possesses more discernment than the generality of your readers.

In reference to that letter in your Work, I find you have it in print, at the commencement of the third paragraph, " The leading features of *my* theory are these," but on reference to the original, I find that I have it in writing, " The leading features of *the* theory are these," and therefore I either committed an error in transcribing the copy sent you, or it was a typographical error of your printer, and although it is rendered in three or more places in the subsequent part of my letter " the theory which I advocate," yet " A. Y." may have supposed that I claimed such theory as my own; but I can assure him that I never intended so to do, and for three reasons, first, because I knew that part of it was not my own; secondly, because, that although I conceived it was partly my own, yet bearing in mind the proverb or maxim, " there is nothing new under the sun," I concluded that I might improperly claim that which belonged to another, by priority of thought and expression; and thirdly, because from want of recollection, I could not distinguish between that which I derived by reading, and that which might have occurred to me as the result of reflection; and as " A. Y.," or some of your readers may imagine through such error of transcript or typography, that I meant to pirate the views or discoveries of others, I have conceived this explanation due to myself, in order to endeavour to set myself right on that point with your readers, and if you have the means of referring to the copy sent you, I shall feel obliged by your stating in a note, whether the error lay with me or your printer.*

* The error lay with the printer, for which he begs to apologize. P. M. M.

"A. Y." states, that he can in nowise subscribe to my opinion, that latent heat is only made manifest by a partial or total decomposition of a body or substance, and to prove its incorrectness, he appears to borrow the idea suggested by "W. A. K.," page 22, of June 13th Number, and states, that cold iron may be hammered until it is heated sufficiently to ignite a match, and that such an effect is produced without any decomposition of the iron, and precedes such statement by the observation, "that decomposition implies the chemical separation of the constituents of a compound body," to which definition of the word decomposition I perfectly subscribe; but I by no means agree with him in opinion, that a partial decomposition of such iron is not effected, as relates to its original constituent atoms, inasmuch as I believe, that the latent heat expelled by the percussion, formed a constituent portion of that iron previous to the operation, and as the constituent ponderable atoms of such iron are caused by compression, to occupy a smaller space, their structural position being changed, so the constituent imponderable atoms of heat, which occupied the interstices resulting from the structural arrangement of the ponderable atoms, are separated from the body by the compression of its ponderable atoms into a smaller space, and thereby the iron, as an integral body as relates to its original structure and composition, is partly decomposed. But as I have already furnished my views on this subject, in a letter sent to you about a fortnight before I read A. Y.'s letter, in reply to W. A. K. on his strictures on Dr. Black's theory of latent heat, I must beg to refer A. Y. to that letter (if inserted) for a fuller explanation.

That the appearances exhibited by "the particles of almost any powder when mixed with water in which they are insoluble," are to be attributed occasionally to disturbances caused by agitation or variation of temperature I do not doubt; but do not believe that they are solely to be attributed to such causes, or that all chalk called carbonate of lime is *saturated* with carbonic acid, and that a combination of free acid in water will not combine with such chalk, and thus cause the agitation of the insoluble powder as described; and I am fully aware as well as A. Y. of the combination of acid with chalk (denominated sulphate of lime) and that water termed "hard" frequently holds sulphate of lime in chemical solution; but I have yet to learn that no chemical action will ensue upon the insertion into such water of a variety of insoluble powders containing carbon.

It appears to me evident, from the observation of A. Y. relative to a vat of boiling wort, and his exposition of the cause of the ebullition of water beneath the exhausted receiver of an air-pump, that he did not fully comprehend the meaning of my expressions, or the views which I endeavoured to inculcate in the illustration of the subject, as his allusion to the water being previously raised to a certain temperature before it is placed beneath the receiver is a necessary preliminary to effect the process of ebullition, exemplifies. He appears to me to suppose, that I meant to convey that water at the temperature of the atmosphere being placed beneath the receiver, receives as much free caloric through the pores of the glass, upon the withdrawal of the air within, as is sufficient to raise its thermometric temperature to the boiling heat of water in vacuo, and that such is the cause of the ebullition; but I did not mean to convey any such idea, and I made no allusion to the thermometric temperature of the water previous to its being placed beneath the receiver, as Mr. Prater did not, and therefore did not consider it as necessary; but what I meant to convey was, that the mechanical force with which the caloric entered into the interior of the water, in obedience to the law of equal diffusion to which it is subject, consequent upon the withdrawal of the air from the receiver, produces the agitation of the water, and which agitation is termed ebullition. The material (and perhaps important) point of difference in opinion between A. Y. and myself appears to me to be, that he conceives that the water contains an inherent power or principle of action, which causes the liberation of the caloric contained in the interior of the water, the moment the pressure of the superincumbent atmosphere is removed from its surface, and the consequent formation of vapour; whereas I conceive that it possesses no such inherent power or principle of action, but that the formation of vapour, resulting from the with-

drawal of the air from the receiver, is in consequence of the access of caloric through the pores of the glass receiver, to fill up the space previously occupied by the air withdrawn, the displacement of a portion of the ponderable atoms of which the water is composed, to constitute the vapour which occupies the space previously possessed by the ærial fluid, and that the ebullition resulting is caused by the mechanical force with which the admitted caloric rushes in among the atoms of which the water is composed, in order to create that vapour, and fill the space resulting from the removal of the ponderable atoms required as the constituent portion of such vapour. And in order to render myself the better understood, I will state it as my opinion that on the supposition that the mechanical structure of the air-pump could be so perfected as to enable the withdrawal of the whole of the air from within the receiver, that no vacuum would be thereby created, as is usually supposed, but that the space from which the air was withdrawn would be occupied by *latent* heat, derived from the external air obtaining access to the interior of the receiver through its pores (atomic interstices), agreeable to the law of equal diffusion to which heat is subject, such heat being free and active during its transit, but latent during its occupation of the receiver. And whether this is new doctrine or not I cannot tell; but leave it to A. Y. and others to determine.

As relates to the theory of the circulation of the blood, I carefully avoided making any further allusion to it in my comments on Mr. Prater's observations relative thereto than appeared to me to be sufficient to refute the opinion which he endeavoured to inculcate, that its circulation was attributable to the inherent activity which it possessed, because I was perfectly conscious of my inability to do the subject justice, for want of a sufficient knowledge of anatomy, and also because I considered that my letter was sufficiently long as not to justify any further intrusion on your pages. But it does not appear to me that "A. Y.," with the aid of the knowledge of that science, has by any means succeeded in proving that the circulation of the blood is not due to the impartation of heat to it in its passage through the lungs, in consequence of the decomposition of atmospheric air inhaled in the process of respiration: and all he appears to me to have done is, to point to the organic action of the heart, in assisting to propel the blood throughout the animal system as a secondary cause, subservient to the primary cause—the impartation of heat thereto in the lungs, to an amount equal to the abstraction from the exterior surface of the body, so as to preserve it of an invariable and high temperature, provided suitable clothing and other means are employed to prevent the abstraction from exceeding the impartation, or provided the impartation is increased by the accelerated action of those organs (and consequently the accelerated circulation of the blood) resulting from muscular exertion (such as walking, running, &c.) to an amount equal to the natural abstraction to which the body may be subject. And thus we find that the faster we walk or run, the more air we inhale, the greater is the amount decomposed, the greater the amount of heat imparted to the blood, the quicker the organic action of the heart, the more rapid the circulation of the blood, and the greater is the amount of heat by such medium which is diffused throughout the animal system. And this organic action of the heart, as a secondary power, I conceive to be as indispensably a necessary appendage to the primary power, as the air-pump is to the steam-engine, enabling the propulsion of the condensed water, the uncondensed vapour, and the air from the condenser, which the primary power, heat, had, as the principal constituent of steam, caused to be conveyed there; and, as analogy frequently assists the inquirer in his search for truth, it may perhaps serve the present case for me to point out that, although cold water and cold wort will pass through a refrigerator constructed, as mine is, of small pipes inclosed in large, the receiving and the dispensing pipes being both open, yet if hot wort is allowed to enter in one direction into the half-inch pipes, and cold water in an opposite direction into the inclosing pipes, so as to enable the water to circulate round the half-inch pipes, and thereby abstract the heat from the wort to an amount to cause both to be of an equal temperature (and for illustration sake, cause both to become of blood-heat in some part of the refri-

gerator,) then neither the wort or water will flow through those pipes, unless forced or drawn through by a pump, or air-pipes are inserted, communicating with the interior of each. Now, such being the practical fact, and as no doubt "A. Y." is much better acquainted with anatomy than myself, I will ask him the question; If the veins and arteries are destitute of those air (pipes) vessels, serving the same purpose as those which are attached to my refrigerator? And if not so, whether or not the organic action of the heart, to cause the propulsion of the blood throughout the veins and arteries, is not as necessary as a force or suction pump would be to my refrigerator, provided I could not or did not supply the air pipes? And again, I will ask "A. Y." if the coagulation of blood in a very few minutes after its withdrawal from the body, is not due principally to the reduction of its temperature, as well as the chemical changes it experiences by its exposure to the atmosphere? And if such coagulation is not a corroborative proof of the necessity of the continued impartation of heat, and the non-contact of undecomposed atmospheric air to and with the blood to insure its fluidity, and thereby enable it to circulate throughout the system? And if what are termed chilblains is not the result of the abstraction of heat from the blood circulating through the parts affected, exceeding the impartation by medium of the lungs, and thus causing it to coagulate and become solid in the circulating vessels, and if not soon restored to fluidity by the impartation of external heat, its vital principle (may I say heat and oxygen) is lost, and it becomes putrid, terminating in a sore?

Having thus furnished "A. Y." by my questions an opportunity of dispensing knowledge to your readers and myself, and much more than those enquiries embrace, I trust that he will not fail to answer to the call, even though it may lead to my discomfiture, for I shall be glad to be undeceived as to any errors which I may have imbibed, and if in this controversy (if it may be so termed) I have succeeded in provoking the elicitation of useful information from others, which I may not have been able to impart myself, I shall rest satisfied that I have accomplished some good, which has been the purport of the endeavours of

Your obedient servant,
G. A. WIGNEY.

Brighton, August 14th, 1840.

REMARKS ON MR. SMITH'S PATENT SCREW PROPELLER AND CAPTAIN CHAPPEL'S REPORT OF EXPERIMENTS MADE WITH IT IN THE "ARCHIMEDES" STEAM SHIP. BY J. P. HOLEBROOK, ESQ.

[Concluded from page 282.]

It will be probably found, that the greatest economical effect will be derived from a screw-propeller, which shall consist of parts of threads of a many-threaded screw, with the interior parts of the threads cut away; the medium angle, which these parts of threads make with the axis of rotation, being about 45°, the diameter of the propeller about 12 or 15 feet, and the crank shaft of the engines making about 35 or 40 revolutions per minute; but, even under these circumstances, there will be a loss of power, arising solely from the direction of the resistance of the water, not coinciding in direction with the line of motion of the vessel as we have before shown, in explaining our diagram, of about 30 per cent., besides loss arising from the slip and various other causes.

If, now, these conditions are essential to a good screw-propeller, which I believe every scientific mechanic will allow, after a consideration of the subject, and without consideration, opinion is of no value, it will be seen, that the screw-propeller of the *Archimedes* violates every one of them; and, because she does so, I think her propeller a bad application of, as I have before endeavoured to show, a bad principle.

I purpose now to make a few remarks on a pamphlet just published, and written by Capt. Edward Chappell, R. N., a gentleman who was deputed by the Commissioners of the Admiralty to examine into, and report upon, the performances of the *Archimedes.* Though this pamphlet is written in a clear and subdued style, yet, as it contains remarks with which I cannot agree, and calculations which I cannot understand, I may, perhaps, be allowed to make the following observations, with a view to explanation, by those who may understand

the subject better than I do. My observations will, in general, proceed in the same order as those made by Captain Chappell.

Out of the six trials between the *Archimedes* and the *Widgeon*, it appears that the *Widgeon* beat the *Archimedes* four; and it would seem that the *Archimedes* only beat on these two occasions, in consequence of the wind's favouring the propeller of the *Archimedes* more than the paddles of the *Widgeon*. Now, from the greater diameter of the cylinders and the slightly greater length of stroke of the engines of the *Widgeon*, this vessel ought to have beaten the *Archimedes* on every trial. But these trials, and, indeed, all the others which are recorded in the pamphlet, are of no value as experiments, inasmuch as we have scarcely any of the necessary conditions. For instance, in these six trials we have the speed of the vessels, and the number of strokes of the engines of the *Archimedes* alone per minute; we have the state of the wind and sea, and the use which was made of the sails. But we have not the pressure of steam in the boiler of the *Archimedes*; nor have we the diameter of the paddle-wheels, nor the pressure of the steam in the boiler, nor the number of strokes per minute made by the engines of the *Widgeon*. Without these absent, but yet important data, we can only come to the conclusion, that the *Archimedes*, with smaller cylinders and greater draught of water, twice beat the *Widgeon*, when, but for the wind, the *Widgeon* would, and ought to, have beaten her. Thus, therefore, these experiments, showing no extraordinary rate of speed compared with what is attained by many steam-vessels, prove no more against the efficiency of the paddle-wheel as a propeller, than would be proved against it, if one boat of a superior kind fitted with paddle-wheels, beat an inferior boat, also fitted with paddle-wheels. The fact of the boat which was beaten being fitted with paddle-wheels, could not be any argument against the efficiency of the wheels, because, it is scarcely possible for two boats to be exactly so constructed, that they shall exactly equal each other in speed.

Being no seaman, and yet having occasion to differ on points, supposed to come generally more under the observation of seamen than landsmen, I beg it to be understood that whenever I may seem to tread upon proscribed ground, I may be considered merely to suggest, or to speak under correction.

With respect to the position of the screw in the *Archimedes*, I cannot entirely agree with Captain Chappell; for though it is an extremely good position, as regards the working of the instrument, and for keeping the bearings from an avoidable resistance from the water, yet I am not quite so certain of the safety of the position, as regards the stern of the ship; and I will explain why: Whenever the steam aids the passage of the ship there must be pressure upon the screw, and this pressure, agreeably to what I have before said, will be exerted sideways as well as forwards. It is true that the opposite parts of the screw will work in opposite directions, and this, it might be imagined, would counteract any lateral pressure; but, from the opposite parts always working in water, which from a variety of circumstances will resist unequally, there will always be a motion which will not be counteracted for the moment by any opposite lateral force, and there will therefore be a tendency to shake the heel* of the vessel; and this effect will also be increased by the greater distance of one part of the screw from the centre of gyration of the vessel, than the distance of every other part of the screw. In consequence of this varying distance of parts of the screw from the centre of gyration, the head of the vessel should perform a minute gyration round a point every time the screw revolved. The vibration of the *Archimedes*, which has been entirely attributed to the employment of cog-wheels, ought to have been, in a very great degree, ascribed to this effect of the screw. The heel of a vessel, at all times the weakest part of it, will be made considerably weaker by its being the position for the bearings of a propeller,

* I am not positive that, in using this term, I am correct; but in order that I may not be misunderstood, I beg to say that I consider that part of a vessel to be called the heel which would be represented by such part if the whole vessel were metaphorically considered as a foot. The heel that I mean is a triangular part of the stern of a vessel, bounded on two sides by the stern parts of the keel and the lower parts of the stern post. As regards the more forward parts of the hull of the vessel, it is as a cantilever in a building; but, unlike a good cantilever, it does not diminish in size as its leverage increases, but, on the contrary, it becomes larger and larger—it is a cantilever of the worst form.

the resistance against which, and consequently against these bearings, is that which impels the vessel forward when under steam alone; and the position of the propeller does not seem to make it quite so secure from shot as Captain C. concludes it to be. I do not mean to say that it is not not more secure from injury from shot than a paddle-wheel is, but that it is not secure from shot properly projected. I can imagine that shot, fired at certain angles, and with certain velocities, will rebound from the water almost as they would from the ground; but I can also conceive shots to be so projected, as regards velocity and direction, that they will plunge into the water. Let us suppose one of the enormous shot or shells which are now in use to strike the propeller, and the shaft to be bent, the result would be that the whole power of the engines would be employed, until they were stopped, in shaking the heel; the stern-post might be loosened; and the safety of the rudder might be endangered. Add this risk to the continual shaking of the stern part of the frame of the vessel, from the action of the screw on its bearings, and the position of the screw-propeller, in respect of the strength and security of a ship, does not seem at all advisable. Contrast the mischief resulting from a shot thus striking the screw-propeller, with what would ensue from one striking a common paddle-wheel; and let us suppose the worst case, namely, that of the wheel being put out of shape for revolving. It would then only be necessary to strip off the lower paddle boards, and the ship would be as useful for sailing as she was with the wheel perfect, and revolving loosely in the water; the frame of the vessel would be uninjured, which could scarcely be said to be the case if the screw-propeller were injured.

Under the head of "Construction," Captain C. proposes to protect the propeller from galvanic action by the introduction of a zinc band. The reason of this, as regards the propeller itself, is not obvious, though it is as regards the ends of the shaft of the propeller, and the bearings which receive these ends. A coating of varnish would, to my mind, effectually protect the propeller itself from all galvanic action, and it would then only be necessary to protect the bearings and the ends of the shaft, these being always laid bare by working, to galvanic action. Some such protection, it would appear, had been afforded to the steel bearer which Captain C. mentions, as exhibiting no symptom of wear, under the head of "*Friction*," though it must have revolved 1,881,691 times. There does not seem to me to be any danger of wear from the bearings of the screw getting hot while these bearings work under water, the heat of boiling water itself not being at all capable of softening steel.

Of the velocity with which the screw revolves, I have something to say. Taking the ordinary rate of revolution of the crank-shaft to be 26 per minute, and that, for every revolution of this shaft, the screw revolves $5\frac{1}{3}$ times, we find that the number of revolutions of the screw per minute is $138\frac{2}{3}$, and per hour ($138\frac{2}{3} + 60 =$) 8320; multiplying this by the circumference of the screw, (or the diameter, 5,75 feet, + 3,14 =) or 18,05 feet, we find that the circumference of the screw revolves at the rate of 150,176 feet per hour; and dividing this product by 6116 feet (as so many feet go to a geographical mile), we ascertain that these parts revolve at the surprising speed of $24\frac{3396}{6116}$, or more than $24\frac{1}{2}$ miles per hour, when the engines are working at their ordinary rate. But if these had been working at the rate of 32 revolutions per minute, the same parts of the screw would have revolved at the astonishing velocity of (26, : 24,5 : : 32 :) 30,15 miles per hour; or, again, if the screw had revolved at the rate at which it is proposed to make it revolve in the light iron boat in progress of construction, or if it had made 200 revolutions per minute, which would be equivalent to the engines working $37\frac{1}{2}$ revolutions per minute, then these parts of the screw-propeller would have revolved at the enormous rate of (26, : 24,5 : : 37,5 :) 35,33 miles per hour.

Some observations which I wish to make on the slip, or, as it is called in this pamphlet, the loss of power of the screw, will not here be misplaced. I may now, perhaps, remark that the angle which Captain Chappell gives under the head "Angle," as the angle which the thread of the screw makes with its axis, appears to be incorrect, inasmuch as a thread which makes one turn in 8 feet of length, should make an angle at its circumfe-

rential parts of about 66°. This observation would have been unnecessary, but for the length of 8 feet, with an angle of 45°, appearing to be at variance with the observations which I have before made, in which I have supposed this angle also to be of 45°, and have made the proportional length of one turn of a thread to be more than double that which Captain Chappell has made it.

The mode of estimating the slip of the screw, by the difference between the speed of the vessel and the rate at which the parts of a screw-propeller pass backward, as it may be said, has been generally that which is adopted by Captain Chappel, but it is not the less incorrect on this account. In the case of the *Archimedes'* screw, according to the pamphlet, it appears that "the speed of the vessel is less than one-sixth short of the rate at which the screw revolves." Of course this statement literally considered is erroneous; because, the strict meaning of the word "revolves," would give agreeably to the speed with which I have just shown the screw revolves, ($24\frac{1}{2} - \frac{24\frac{1}{2}}{6} = 20\frac{5}{12}$ or) more than 20 miles per hour; the meaning, therefore, of the words, "the screw revolves," is, *the parts of the thread* of the screw may be said to work in a direction contrary to the *line of motion of the vessel.* It is said that, "if the screw-propeller worked in a solid instead of a fluid," it could but "advance 8 feet at every revolution." Now, unless it can be shown that the screw meets with no resistance laterally, or in its line of revolution, which I think no one will assert, who considers the subject for a moment, it is perfectly correct to estimate the slip, as the difference between the speed at which the vessel goes, and the speed at which the screw revolves; and, as it appears that the screw revolves at the rate of more than $24\frac{1}{2}$ miles per hour, and that, "the utmost speed of the *Archimedes*, through the water under the power of steam alone, amounted" only "to nine" miles and a quarter; it follows, from this mode of calculating the slip, that, instead of being less than $\frac{1}{6}$th, or $16\frac{2}{3}$ per cent. of the speed with which the screw revolves, it is ($24\frac{1}{2} - 9\frac{1}{4} = 15\frac{1}{4}$, or supposing $24{,}5 : 100 :: 15{,}25 :$) $62\frac{1}{4}$ per cent.; or, if we compare the speed of the vessel with the speed of the screw, instead of these being as 5 to 6, they will be as $9\frac{1}{4}$ to $24\frac{1}{2}$. I shall scarcely be met with the argument that the screw is not resisted laterally by the water; but, remembering some of the statements I have heard of the properties of the screw-propeller, I will instance a proof that there is such resistance. Suppose we were to take two screws, such as this propeller, and place them at the sides of a vessel with their shafts in the same direction, as the shaft of a common paddle-wheel, and work these shafts, as we should work a shaft of a wheel. I think no one will deny that, upon these screws, or, as they would then be termed, paddle-wheels, being put in motion, the combined action of the two screws would be to propel the vessel: and I will say, that the resistance, of the water to the screws, being supposed to be equal, both when these screws were used as screws, and when they were used as paddle-wheels, these screws, thus differently used, would be nearly equally effective in propelling the vessel, provided the angle, which the thread made with the axis at the circumferential parts, was 45°; and I believe, that, using the screws in this way like paddle-wheels, we should find a better result than $9\frac{1}{4}$ miles per hour for a speed of the screws of more than $24\frac{1}{2}$ miles per hour. But, let it not be imagined, that I would propose any such plan as this mode of using the screw; because I am perfectly satisfied that thus used, it would also be productive of loss of power; I have only made this supposition, for the sake of showing that the resistance is lateral, as well as backward; of course to any one who understands the application of power, such a proof will appear totally unnecessary. I need only observe, on this subject, that many paddle-wheels, (or screws, as they may almost be termed, but for the direction in which they revolve, as regards the direction in which the vessel is desired to be propelled,) of the kind just mentioned, have been patented at various times; I need only mention Mr. Dickson's Mr. Samuel Hall's, and Lieutenant Hall's; without naming probably many others. As respects the slip, it will appear from my mode of reckoning it, that it is almost incomparably greater in the case of the screw than in the case of the common paddle-wheel; because, according to the statement in Captain Chapell's pamphlet,

it appears that the slip of paddle-wheels, being one-fourth of the rate at which the wheels are travelling, and, by consequence, one-third of the speed with which the vessel moves, it, (the slip) is, in the case of the screw, as compared with the rate at which the vessel moves, as 15¼ to 9¼, or (9¼ : 100 : : 15¼ :) 164$\frac{33}{37}$ per cent. The allowance of one-fourth of the rate of the paddle-wheels, for the slip, I may passingly remark, is rather too liberal.

The importance of Captain Chapell's observations with respect to the getting rid of the overhanging weight of the paddle-wheels, &c., upon the topsides of a vessel, by the substitution of a screw-propeller for paddle-wheels, is more seeming than real; for it is proposed to substitute for this weight a weight or pressure, of another kind. In the case of a vessel of war by guns, and by larger masts and spars and sails; and, in the case of commercial ships, by all of these but the guns. The weight of extra guns and the pressure and weight of larger masts, spars and sails will strain a ship, I am apt to imagine, as well as weight of paddle-wheels and their concomitants.

Under the head of "Resistance," Capt. Chappell records that the key of the piston got loose when the *Archimedes* was in the Firth of Forth, and rendered it necessary to extinguish the fires, which would have completely crippled a paddle-wheel steamer; that sail was made upon the vessel, and that it succeeded in holding way with one of the fastest sailing yachts upon the Firth. From having made these observations, I presume Capt. Chappell has never read a "Memoir of Her Majesty's Steam Ship, the *Medea*, during a service of nearly four years, by Thos. Baldock, Lieut., R.N., K.J.S., published in the last edition of "Tredgold on the Steam Engine, &c.," edited by W. S. B. Woolhouse, Esq. A perusal of this memoir will put to flight all fear of an efficiently fitted and rigged steam-vessel being crippled by the circumstance of her engines being out of order; and it will besides show what such a steam-vessel can do merely as a sailing-vessel, even though she be fitted with, to use Lord Dundonald's words, quoted in Capt. C.'s pamphlet, "such a barbarous contrivance as paddle-wheels." Capt. C. will see that the "speed of the *Medea*, with the wheels detached from the engine, and revolving by the reaction of the water, as the ship is impelled by the influence of the wind on her sails, when the wind is "blowing strong, smooth water, close-hauled within six points," was "8½ knots;" and with the wind "blowing strong on the quarter, was 11½ knots; a speed which it appears the *Archimedes* could never reach, her highest speed being 10¾ knots. And from this memoir, Capt. C. will further see that the employment of paddle-wheels is perfectly compatible with the fitment of a vessel destined to sail as well as almost every ship, and in a superior manner to the much larger number.

With respect to what is stated under the head of "Steerage," I would observe that it is very easy to understand how the screw-propeller facilitates the turning of the vessel. Whatever difference there may be between the resistance of the water to the upper and under parts of the propeller, (and, from the greater pressure of the water upon the under parts, in consequence of the greater depth at which they work, there will at all times be a considerable difference,) it will be exerted in a line perpendicular to the surface of the propeller, and will tend to press the stern of the vessel round, which it will really effect unless counteracted by the helm. This remark is borne out by the pamphlet, from which it appears, that "the instant the screw begins to revolve, it throws a column of water astern, which impinges upon the rudder, and actually alters the direction of the vessel's head a point or two, before she gets way through the water." With respect to the water's impinging on the rudder producing the turning of the ship, I would remark that were this impinging productive of any effect in turning the vessel, it ought not to turn at all; because the water from the screw must impinge, seen or unseen, upon *both* sides of the rudder, from the contrary action of the upper and lower parts of the screw. Besides, it is perfectly incomprehensible how any force exerted upon the rudder by the screw, the bearings of the screw and the rudder maintaining their relative positions, can effect the turning of the vessel; for we always find when motion is produced, that the body exerting force continually departs from the reacting body; yet, in the case under consideration, the bearings of the screw neither

depart from the rudder nor the rudder from the bearings. A screw-propeller, working in a case, without connection with the exterior water, however much the water from it might impinge upon parts of the case, would neither move the case in one direction or another; nor can the water's impinging upon the rudder, in the case of the *Archimedes*, press the vessel sideways, or in any other direction. The fact is that the water is not really thrown off in radii, though it may appear to be so; but is thrown off in perpendiculars from the surface of every part of the screw, these perpendiculars being slightly modified by many unimportant operations. This will also account for the water not being thrown against the vessel, when the screw is used for backing. But it may be asked how this lateral action of the screw comes not to be felt when the vessel has way?

Whenever this is the case, the velocity with which the propeller revolves is so great, that before the vessel has time to feel the lateral direction given to it by the action of the screw, arising from the difference between the resistance to the opposite parts of the screw, another and a contrary lateral direction is given to it, and before the ship feels this direction, another contrary one is again given to it; and thus, from the contrary and rapidly succeeding directions given, the vessel obeys permanently, when under way, only the one, which results from all these opposing ones; but still it appears by the vibration in this vessel, which I attribute in a great measure to this action of the screw, that the results of this action are obviously perceptible.

I come now to the consideration of the power of the vessel, which is now ascertained not to exceed 65 horses. How this is to be explained I cannot understand, unless we are to suppose that the work, in the way of experiment that the *Archimedes* has done, in the course of about fifteen months, has been sufficient, with this propeller, to reduce engines of originally 90 horses power to that of 65 horses. For some time past the *Archimedes* has been given out as of 80 horses power, and now she is of 65 horses. Really, if the deterioration of the engines goes on thus, as this vessel gets older we may soon expect to find her engines of no power at all. I do not say that these engines were originally of 90 horses power from my own observations, but from a published letter of Mr. George Rennie, which I have before me at the present moment. Mr. Rennie's own words are—"The engines are united in one frame, the upper part of which is supported by columns of wrought-iron. They consist of two cylinders, three feet in diameter each, and one air pump between them. The dimensions of the platform on which the engines rest are 12 feet in length by 4 feet in width. The length of the stroke is 3 feet. The power is estimated at 90 horses." I am not aware, sir, that so accomplished an engineer as Mr. George Rennie does not know how to estimate the power of steam engines; and I can, consequently, only reconcile the fact that the engines of the *Archimedes* are at present of only 65 horses power, by supposing them to have become deteriorated by the employment of the screw as a propelling instrument, even in an experimental way, or by taking a different estimate of the power of a horse, which if done in this case ought to be known. But I shall now show that the power of these engines should be estimated at fully that of 90 horses.

These engines make 26 strokes per minute, each stroke being up and down 6 feet in length; this gives a velocity of ($26 + 6 =$) 156 feet per minute. The diameter of the cylinders is 36 inches, which squared gives ($36 + 36 =$) 1296 inches. The mean effective pressure will be at least 7,1 lbs. per circular inch. Now, multiplying the square of the diameter in inches (or 1296) by the effective pressure in pounds per circular inch (or 7,1 lbs.), and the product by the velocity in feet per minute (or 156), the product will be the number of pounds raised 1 foot high per minute; which, if we divide by 33000, we obtain as the power of each engine ($1296 + 7{,}1 + 156 \div 33000 =$) about $43\frac{1}{2}$ horses; and, as there are two engines, the combined power will be equivalent to ($43\frac{1}{2} + 2 =$) about 87 horses—an estimate approaching very closely to Mr. Rennie's statement. But in this estimate we have reckoned the pressure in the boiler to be only 35 inches of mercury, which is equivalent to $17\frac{1}{2}$lbs. per square inch, or to a pressure of $2\frac{1}{2}$lbs. over that of the atmosphere; but the *Archimedes* steam is, according to a statement in the *Morning Chronicle* of the 15th May last, which

I have before me, 6lbs. to the square inch, or 3¼lbs. more than we have just supposed. With this difference of pressure, the effective pressure will be 9,3lbs. per circular inch, and the power of each engine (7,1 : 43¼ : : 9,3 :) $56\frac{46}{71}$, or about 57 horses, which, multiplied by 2, gives for the combined power of the engines about 114 horses. Thus far we have supposed no alteration in the ordinary number of the strokes which the engines make per minute to have taken place during any of the trials which have been made with the *Archimedes*, but if we suppose her engines to have gone at times at the rate of 32 strokes per minute, we shall see that the apparently slight addition of only 6 strokes per minute will add enormously to the effective power of the engines. By our last calculation it was found, that with a speed of the piston of 156 feet per minute, the power of each engine was 57 horses. We find, by the now supposed speed of (32 + 6 =) 192 feet per minute, the power of each engine to be (156 : 57 :: 192 :) $70\frac{2}{13}$ horses; and, by consequence, the power of both engines to be equal to 140 horses—a pretty large power for a vessel of 237 tons burthen, and one with which a common paddle-wheel might have been supposed to have done a little more than the *Archimedes* has. By supposing this rate of speed to have existed at times, we have only supposed a speed which Captain Chappell appears to have thought but the proper speed of the engines. It is not too much to imagine, that this rate of speed may at times have been considerably increased, when we consider the short time during which many of the trials of speed of the *Archimedes* with casually passing vessels lasted. But of the number of the strokes, under these circumstances, we have no account, and consequently it would be useless to enter into any calculation in respect of any increase of this kind. With respect to the avoidance, by the use of the screw-propeller, of the swell occasioned by the back-water of paddle-wheels, it appears very natural to expect that this should be almost entirely obviated; and so it would be if paddle-wheels were used entirely immersed in the water; but as no one would imagine, in this case, that there would be no agitation of the water because it was not visible, so nobody can conceive that with a screw-propeller this agitation does not exist, and to a very great extent. One of the testimonials in favour of the screw mentions that "the rotation of the propeller," by "exerting a *centrifugal* force upon the water under the vessel, in a canal or a river, would agitate the mud at the bottom, so as greatly to assist in *deepening* shallow channels." Whether the gentleman who gave this testimonial speaks from ocular observation of this effect, or whether he most truly assumes this property to belong to the screw-propeller, I cannot determine; but it is at best only a questionable argument in favour of an instrument designed for propelling a vessel, that by it power is exerted as it would be by a dredging machine, because it is quite clear that all power thus employed in disturbing the mud of rivers, by a *centrifugal* action upon the water, is completely thrown away as regards propelling purposes.

I now come to the consideration of that part of the subject which involves the economical application of the screw, instead of the paddle-wheel, inasmuch as this (the screw,) does not interfere with the action of the wind upon the sails. Captain Chappell appears to think that if "a ship can, by canvass alone, obtain a speed of nine knots, it would be extremely uneconomical to apply the power of steam, and incur the consequent expenditure of fuel, merely to gain the trifling acceleration of one and three quarter knots per hour." Practice, in the case of steamers of the present day, seems to be against this idea, and if this should be decided, the argument in favour of the use of the screw propeller falls to the ground; because, if steam is to be continually employed, and it is found that by the use of the screw there is a greater loss of power than by the paddle-wheel, there can be no inducement, by the use of the screw, to incur this constant loss. But if it should be determined that, whenever the wind is favourable, sails and not steam shall be used, then the argument for the preference of the screw can only be founded upon the assumption that the same rate of speed cannot be obtained with paddle-wheels as with the screw-propeller; an argument altogether untenable in the face of the memoir of H. M. S. S. the *Medea*, already mentioned. If by a judicious rig the paddle-

wheel as a propeller can be occasionally employed with effect as great as, or greater than with the screw, there exists no reason for preferring another sort of rig; especially as with this sort it would be necessary "upon encountering light or contrary winds or calms," to "furl sails," and to "down with all masts, yards, and other top hamper."

Some stress appears to be laid in the testimonials of the pamphlet upon the facility with which the screw can be connected and disconnected with the engines, as if this facility were a favourable property of this propeller. For my part, I cannot see any greater difficulty in connecting one shaft with another, whether one happens to bear a screw or a paddle-wheel. It is true, that in the case of paddle-wheels, there will be two connections to make, while with the screw-propeller there will be only one. But, on the other hand, the connections of the paddle-wheel shafts appear to be easier to make than the connection of the screw, from the circumstance of the shafts of the wheels being out of water, while the shaft of the screw is immersed to the depth of about five feet. If it take a much longer time to connect paddle-wheel shafts, this must arise from some faulty difference in the mode of connection. I have a plan by which such connection could be made in a minute or two, with the wheels and crank shaft in whatever positions they might be; which, if you should consider worth publishing, I shall probably send you some of these days.*

There is one circumstance in the use of sails which appears to have great weight with persons who do not sufficiently consider the subject, arising from the fact, that a sailing vessel with the wind a-beam or on the quarter, goes faster than with the wind directly astern; and because in the former case, the sails are placed obliquely to the line of the vessel's motion, instead of being placed transversely to it, as in the latter case, such persons seem to consider that, if the propelling surface were alike placed obliquely, it would alike produce greater effect than if placed transversely; and because in the screw-propeller the oblique direction obtains, and the transverse direction in the paddle-wheel, these persons argue that the screw-propeller should be a more efficient one than the paddle-wheel. But here never was a worse founded argument. Sails placed obliquely do not give a greater propelling effect for the quantity of wind which strikes them, than they do when placed transversely, nor anything like the same propelling effect. But from the obliquity of positions, and the direction of the wind, the whole length of the vessel is crowded with sail, and a quantity of wind used, which is proportioned to this length, while in the case of a wind astern, the sails upon one mast prevent the wind acting with its full force upon the sails of more than one mast. Were there twenty masts, each equally rigged with sails, the sternmost one alone would receive any great amount of pressure from the wind; for this does not blow against one sail, turn round when it has passed it, and blow against the sail behind; but, pressing against the sternmost one with its full force, it slips aside, and then passes ineffectually by the edges of all the more forward sails; the better progress of the vessel with obliquely inclined sails, is therefore solely due to the greater quantity of wind used. By the mechanical process, called the "parallelogram of forces," to which I have alluded in the former part of these observations, the greater total propelling effect of a large quantity of wind upon sails, though coming in a bad direction, over a much smaller quantity of wind, coming in the best direction, will become evident. It should be borne in mind, that whether we use a large or a small quantity of wind, the cost is the same, this being nothing; but when the propelling power essentially resides in coals, never too cheap, it becomes a matter of the greatest importance to turn them to the best possible account; and it is therefore indispensably necessary, that we should use that direction of surface from the employment of which the greatest possible effect can be obtained; and, under these circumstances, the transverse or paddle-wheel board direction will be used in preference to the oblique or screw-propeller direction.

With respect to the testimonials appended to Captain Chappell's Reports, I shall only observe, that when carefully considered, they must go for very little,

* We shall be happy to receive it.—Ed. M. M.

even when they are most favourable, and some of them can scarcely be said to be *in favour* of the screw-propeller. All, I think, speak against the noise produced by the machinery used to give the requisite velocity to the propeller, and none of them give other evidence than that derived from ocular observation, that the Archimedes generally performs her duty well, both as regards sailing and steaming; but this cannot be said to be testimony in favour of the screw-propeller alone, any more than it would have been in favour of a common paddle-wheel, if these testimonials had recorded their evidence to the advantage of a vessel fitted with such a wheel. Some of these testimonials expressly state that the writers wish to say nothing with respect to the mechanical part of the question; and not one of them gives any more than bare opinion for the economical properties of the screw-propeller. I shall conclude my remarks upon these testimonials by transcribing a portion of that from Lieut. Claxton, R. N., Managing Director, Great Western Steam Ship Company, which will best explain of how little value the experiments are, which these testimonials record, and which are supposed to furnish conclusive evidence in favour of the screw-propeller.

This gentleman says, "Before saying much upon what I did witness, I wish to say a few words upon what I do not know. I should have liked to have known the exact consumption of fuel, and to have compared that with the quantum of power it would have taken, say to get 8½ knots out of the same vessel, with the ordinary wheel. For instance, we saw the engine making 25 and better revolutions. What sized wheel would the same engines have driven 25 times round in one minute? and would they have driven a wheel properly apportioned to the length of the stroke, (3 feet I believe, or 12 feet diameter) 25 times per minute, as easily as they drove the screw 133 times? and with which would the *Archimedes* have gone fastest?"

The plan proposed, by Mr. Smith, to obviate the noise produced by the toothed wheels, used to give the necessary velocity to the propeller, by adopting spiral gearing, instead of cogs, is perfectly worthy of the propeller, whose operation it is designed to assist. Of all possible substitutes for cogs which could have been found, I know of none more calculated to produce friction and waste of power than such gearing. The friction of the water, which is a great obstacle to the adoption of the screw-propeller as an economical instrument, will probably wait upon the new gearing with even aggravated evil results. I know not to what we shall soon arrive, under a system of such improvements as that of the screw-propeller and the spiral gearing!

I am now come, sir, to the conclusion of my task, and right glad am I of the consummation; and varying the expression of the elegant words of Dr. Lardner, toward the conclusion of the 6th edition of his "Treatise on the Steam Engine," I will observe that I am not prepared to deny, "that, we are on the eve of mechanical discoveries, still greater than any which have yet appeared; and that the steam engine itself, with the gigantic powers conferred on it by the immortal Watt, will dwindle into insignificence, in comparison with the hidden powers of nature still to be revealed; and that the day will come, when that machine, which is now extending the blessings of civilization to the most remote skirts of the globe, will cease to have existence except in the page of history." On the contrary, I am quite satisfied that the views, herein developed, are warranted by all present observation and past experience: but as the instrument, destined to supersede the steam engine, does not at present exist, so neither is the supercessor of the paddle-wheel, present to my mind, under the form of Mr. Smith's, or any other propeller, constructed upon the principle of the screw.

And now, Sir, with every apology for this long trespass upon your pages, I beg to subscribe myself,

Your most obedient servant,

J. P. Holebrook.

168, Devonshire Place, Edgeware Road,
September 5, 1840.

FRENCH PATENT LAMP-TRIMMER.

Sir,—Light and heat, in certain quantities, are essential to the very existence of man, but his comfort and happiness require a much larger portion of both than are afforded by the natural supplies. Artificial means of warming and lighting, therefore, afford an inexhaustible field

for the exercise of man's inventive powers, producing results as varied as the talents employed, and embracing the most philosophical as well as the most ridiculous projects.

The extraordinary competition in the article of stoves which have been brought forward almost without number by various inventors and patentees, each confidently recommended as "the cheapest" and "the best,"—has frequently and fully been noticed in your pages, accompanied by such salutary remarks as would enable your readers to select that which was best adapted to their several wants.

An almost equal amount of competition has been going on (though more silently) between oil, gas, and candles; but more particularly between a numerous class of oil lamps, suited to our present rigid notions of economy, by their being adapted to burn the common cheap vegetable oils, each proffering peculiar advantages, and each one asserted to be the *ne plus ultra* of economical lighting.

Although this subject has not hitherto received its fair share of our attention, I may perhaps, at a convenient opportunity, endeavour to supply this deficiency; and I only advert to the subject on this occasion for the purpose of introducing to general notice and admiration an article of great utility, and of immense importance to all persons interested in the performance of good lamps.

The best lamps, it is well known, are those constructed upon the principle introduced by M. Argand with a cylindrical wick, and producing a cylindrical flame, the air being admitted both within and without the burner. There are at this time various candidates for public favour, of different degrees of merit, but they are all on this principle, and for my present purpose may all be included under the general term of Argand lamps.

To realise fully the advantage of this lamp, it is essential that the cotton wick should be of an uniform height all round, otherwise the flame is uneven and unsteady—low and ineffective on one side, and giving off smoke on the other, to the imminent peril of the glass chimney. In trimming, it has hitherto been found exceedingly difficult, if not impossible, to cut the cotton sufficiently even, to realize the beautiful flame which theory assigns to the perfection of this lamp.

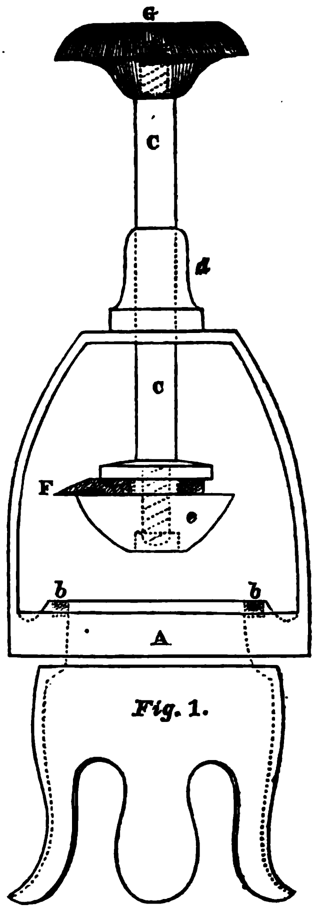
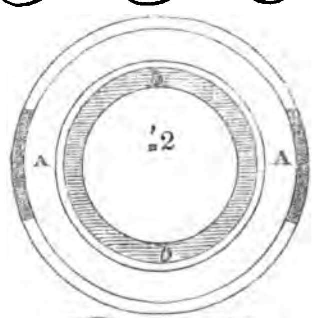
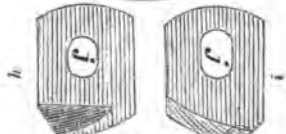


Fig. 1.





With scissars, a series of notches are produced, the result of which is a serrated and uneven flame. The only effectual remedy for this is the employment of a little instrument recently invented and patented in France, of which the accompanying drawing is a full-size representation. A, fig. 1, is a circular brass ring tapered off on the inside, and expanding below as shown by the dotted lines; *b b* is a steel ring, serrated on its inner edge and fixed in the brass ring; C C is a steel rod, moving up and down and turning freely in the collar *d; e* is a hemisphere of brass, which enters the wick of the lamp and expands the cotton, pressing it against the inner edge of the steel ring *b* so as to prevent slipping; F is a steel cutter which, revolving in contact with the steel ring, forms a species of shears, cutting the cotton in a very clean and perfect manner. The cut is made by pressing down the cutter and turning it completely round by means of the milled head G. *h* and *i* are two views of the cutter detached, *h* being the upper and *i* the lower surface. The oblong hole *j* is to allow the cutter to be set more or less forward, as may be found necessary. Fig. 2 is a perpendicular view of the serrated ring *b*, firmly set in the brass seat A.

These lamp trimmers (B et F Brèvetés) have been imported, and are now exhibited for sale by Mr. Plum, cutler, in St. Clement's Church-yard, Strand. The instrument is a decided novelty, and possesses considerable merit, and when it becomes known will be considered an indispensable appendage to all Argand lamps.

When our manufacturers avail themselves of this ingenious invention, as they most assuredly will, I would suggest the introduction of a spiral spring between the cutter F and the collar *d*, in order to keep the cutter in close contact with the cotton, leaving little more to do than by turning round G, to complete the operation of trimming.

I remain, Sir,

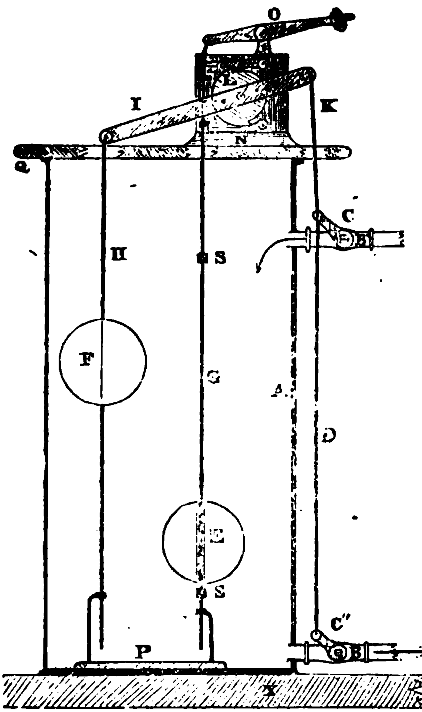
Yours respectfully,

WM. BADDELEY.

London, September 1, 1840.

WATER MEASURING MACHINE.

Sir,—Considering the subject of Water Measuring of great importance in many points of view, and having bestowed some time and labour upon it, I send you a description of a machine that I have invented and had at work, supplying an eight horse condensing engine, for the last six months, not doubting but that you will give it a place in your Magazine for the benefit of its readers.



A, a cylindrical lead cistern standing on the table X.

B′ B″, two brass cocks attached to the cistern.

C′ C″, levers fitted on to the square of the cocks.

D, a rod connecting the two levers.

E and F, two air-tight hollow copper balls; the one marked E sliding freely up and down the brass rod G, between the collars S S: the ball F is made fast to the brass rod H, which rod is jointed to the lever I; the other end of the lever has a short connecting rod K jointed to it, and also to the lever C; at the back of the lever I there is an iron disc L, fastened to it by two rivets.

M, is an iron plate, in the centre of which there is a stud for the lever I; two other studs are rivetted to the plate

for the two catches N N; the lower catch being kept up to its work by a spring.

O, a lever and weight to balance the rod G.

P, a stand for the purpose of steadying the ends of the rods G and H.

Q, a deal board extending across the top of the cistern, and serving as a foundation plate.

The *modus operandi* consists in the alternate opening and shutting of the two cocks, whereby water is admitted into the cistern to a certain height, and then discharged down to a certain level, regulated by the floating ball E coming in contact with the two collars on the rod G, unlocking the lever I, and allowing the ball F to raise it by its buoyancy, or when the water is down, to fall by its own weight; the number of times the cistern is filled and emptied being registered by a counter.

I have so far attempted to give you a rough idea of the construction of the machine as it is now in operation, and I may say, that as far as regards myself, it is original—a first attempt.

The machine does its work well, delivering at each stroke 4,860 cubic inches of water.

If I had to construct one on a larger scale, I should make a few alterations, which I may as well mention: Instead of the two cocks B′ B″, I would have two slide valves; for the copper ball E, I would substitute a flat float; and the lever and weight O I would put upon the same fulcrum as the lever I; and, lastly, it is not necessary that the two cocks B′ B″ should be so far apart—they might both be at the lower side of the vessel.

I beg to remain,
Yours respectfully,
M. NOTON.

27, Islington-street, Salford, Aug. 10, 1840.

MODEL OF THE COAL FIELD OF THE FOREST OF DEAN.

At a meeting of the Institution of Civil Engineers in April last Mr. Sopwith exhibited a model of a tract of thirty-six square miles of Gloucestershire, comprising the mining districts in the Forest of Dean. This model showed all the undulations of the surface, the towns, villages, and detached buildings, railways, coal and iron mines; and, separating vertically through the centre from north to south, and from east and west, exhibited the geological formation down through the coal measures to the old red sand-stone: the construction is such that, by lifting off horizontal layers, the extent and position of each bed of coal is shown, with the extent of the workings in the different collieries, and on each bed is marked the portion that can be worked by level and freed from water by natural drainage. This coal tract forms an elliptical basin; the longest diameter of which, from N.N.E. to S.S.W. is about ten miles, and the shorter about six miles, ranging round Coleford as a centre. There are about twenty beds of coal of various thickness, containing together nearly thirty-seven feet of clear coal. The carboniferous strata crop out regularly all round against the mountain lime-stone and old red sand-stone, and dip uniformly towards the centre of the basin. This could scarcely be shown clearly, even by an almost indefinite number of plans, which induced Mr. Sopwith to project the model, the method of constructing which he described to be by framing together in squares a given number of thin strips of wood, joining them by half lapping at the intersections; on these strips the profiles of the sections were drawn, from measurements and borings. The compartments of these skeleton frames were then filled in with lime-tree wood, as being lightest and easiest to work, and carved out to the depth of the lines drawn on the strips; by these means a series of horizontal sections fitting into each other were obtained, and when painted of the proper colours, both on the surfaces and on the edges, produced the complete model which he exhibited. The cost of it was about £30 complete. It was constructed under Mr. Sopwith's direction, and from surveys made by him for the Government.—*Trans. Inst. Civ. Eng.*

DESCRIPTION OF THE ENGINES ON BOARD THE IRON STEAM TUG THE "ALICE." BY J. PATRICK, INST. C.E.*

The speed of this boat having far exceeded the constructor's expectations, induced the author to send a description of her proportions, and of the construction of the engines. The chief peculiarity in the engines is their being placed in the centre of the vessel, with the two cylinders in a line with the keel, and placed at an angle of 45°, inclining inwards towards the paddle shaft, to which the motion is communicated direct (without the use of side beams) by long connecting rods

* A brief account of the launch of this boat appeared in No. 856. "Vulcan" has called our attention to a similarity between the engines of the *Alice*, and that of Mr. Whitworth described in No. 885.—ED. *M. M.*

attached to the cross heads, which are placed at the lower ends of the cylinders, instead of being on the top as in the usual manner; the connecting rods are thus enabled to be three times instead of twice the length of the stroke, as is usually the case. The framing is entirely of wrought iron on the tension principle, and appears to resist the tendency to vibration better than cast iron framing. For the two cylinders of 31 inches diameter, there is only one air pump of 22½ inches diameter, with 19½ inches length of stroke, instead of the usual complement of two air pumps, 18 inches diameter each; this is found to be sufficient, as a vacuum of 13¼ lbs. per square inch is maintained. One of the advantages proposed by this mode of construction is the reduction of weight; these engines only weighing 9 cwt. per horse power. The small space occupied leaving more room for passengers, they are particularly adapted for river navigation, where the breadth of beam must be limited. The simplicity of their construction renders them less liable to expensive repairs.

The principal proportions of the *Alice* are—

	feet	inches
Length between perpendiculars	95	
Breadth of beam	20	
Draft of water	4	6
Diameter of wheels	14	
Size of the engines....two	30 horse power	
Diameter of cylinder	31 inches	
Length of stroke	3 ft. 3 in.	

The engines were constructed by Messrs. Davenport and Grindrod, of Liverpool. Drawings of the boat and engines accompany this communication.—*Trans. Inst. Civ. Eng.*

THE "ECLIPSE" STEAMER.

Sir,—In consequence of the extraordinary statements in circulation, as to the powers, &c. of the *Eclipse* iron steam-boat, now running between Margate and Blackwall, I was induced to avail myself of a day's leisure last week, to make a trip in her, on her return voyage.

What has appeared in your pages, as to her dimensions, speed, &c. are tolerably correct, but there is much ambiguity as to how this speed is attained. "A Subscriber," at page 248, says she is not worked by high-pressure steam, because she has a condenser the whole length and breadth of the vessel. Will he have the goodness to say at what pressure she is worked? Boulton and Watt, seldom or ever loaded their low-pressure engines with more than 3½ lbs. upon the inch, and the present practice in our river boats is to keep *under 5 lbs.* Every body connected with the *Eclipse* is pertinaciously silent upon this point. On looking at the engine, I saw by the length of the steel-yard lever, that the pressure at that time on the boilers must have been something considerable, though *the weight itself was most carefully concealed* behind a piece of iron plate. The engine room, which rises 6 or 7 feet above the deck, is closed in with an iron partition, having two doors; upon which is written a notice, that no person is allowed to stand opposite these doors. As I regarded not this notice, the modern *Cerberus* who guards them, ordered me off, representing that my bulky person intercepted the air that was required in the engine-room. This could not be the fact, because I was standing quite on one side, and I told him I had "paid for peeping," and would have a look—whereupon he shut the door, determined not to have me, between "the wind and his nobility."

I need not say that the mystery and concealment so injudiciously practised, (connected as the name of *Napier* is, with some of the most frightful steam-boat accidents on record,) tend to frighten passengers and prevent them from availing themselves of the speed of the "two funnel boat." The owners complain, that they have not been adequately supported, but they have themselves to blame. A subscriber says, "she has less vibration than any boat I was ever in," a statement that at once disparages the whole of his communication, and proves, that if the writer be not Mr. Napier himself, it is at least some one in his employ. The shooting motion of the *Eclipse* is exceedingly unpleasant, the necessary consequence of a single engine so top-heavy as that of the *Eclipse*, and which with very little addition from external causes would speedily induce sickness. The motion of the engine is any thing but smooth, and the speed irregular, varying from 26 to 32 strokes per minute. The power is in excess as compared with the immersion of the vessel; she is all boiler, so much so, as materially to abridge the accommodation in the cabin, and the speed is evidently obtained at a vast sacrifice of fuel—both funnels were smoking away the whole of the voyage. I think it is impossible the *Eclipse* can continue to run, except at a great loss to the owners. She passed the *Ruby* while I was on board, in fine style, but not in finer style than the *Father Thames* had done a day or two before. This boat, which has just been fitted with a pair of Penn's oscillating engines, is supposed to be quite a match for the *Eclipse*, with the advantage of the steam-pressure, &c., being "all fair and above board"—*and open to inspection!*

With much respect, I am, Sir,

Your obedient servant,

CANDIDUS.

Margate, September 8, 1840.

ANOTHER FATAL FIRE IN THE CITY.

Another of those occurrences, which reflect indelible disgrace on the city authorities, took place between one and two o'clock on Sunday morning last, by the breaking out of a fire in the public house, well known as the "Jacob's Well," in Milton-street, Fore-street. There were at the time, four persons in the house, two of whom made their escape unaided, while the others were permitted to perish. A section of the city police were promptly in attendance from the Cripplegate station-house, but they went to the spot *wholly unprovided with any means of rendering assistance*, and no sooner reached the scene of danger than they increased the mischief, by breaking open the lower part of the premises, creating a draught of air which urged the flames up through the house by means of the stair-case, with aggravated fury.

In answer to some questions put by the jury on the coroner's inquest, on Monday, it came out, that the police *had no distinct orders to procure the fire-ladders the first thing*, and although the *keys of the fire-ladders* of Cripplegate parish *were hanging up in the police station, the police were not aware of the fact!* How many martyrs are to be sacrificed before the full measure of iniquity is made up? How often are we to be horror-struck before the "proper authorities" will be brought to a just sense of the claims of humanity? If there were any real difficulty about the matter, some shadow of excuse might be made, but when we know that by placing half a dozen lengths of *portable fire-ladders* in each police-station, with a few simple instructions, the fatal effects of fire might, in nine cases out of ten, be averted, we cannot withhold the expression of our indignation at the apathy manifested about these matters. The *expense* cannot possibly form any objection, for that is exceedingly trifling; the *efficiency of the apparatus* is placed beyond all question, by the number of lives already saved where such provisions have existed. Although *the keys* of cumbersome unwieldy ladders, may, accidentally or intentionally, hang unperceived upon the wall of the station-house, the ladders themselves, if hung there, would tell their own story, and if we are not greatly mistaken, would supersede such a verdict as terminated the present melancholy inquiry, viz.: "That the deceased's deaths were occasioned by the house having caught fire, but how such fire originated there was no evidence; and the jury are further of opinion, that if *proper fire-ladders had been at hand, life might have been saved.*"

THE "FATHER THAMES" STEAM BOAT.

Sir,—Having inserted in your excellent Magazine several articles respecting the speed of steamers, I feel that you will also permit the insertion of the following account of the most complete thrashing ever given to a boat.

On Tuesday last, the splendid and fast steam-vessel, the *Ruby*, the pride and boast of the London and Gravesend Diamond Steam Packet Company, met with a customer who completely took the shine out of her. The *Father Thames*, a new iron steam-vessel built by Messrs. Ditchburn and Mare, of Blackwall, and fitted with a pair of 37-horse oscillating engines, by Messrs. Penn and Son, of Greenwich, went from Blackwall to Gravesend in the short space of one hour and eleven minutes, waited there for the *Ruby*, and allowed her to get a-head; when the *Father Thames* followed, went completely round her, passed her again, and reached Blackwall, leaving the *Ruby* nearly two miles astern, with the *polish* completely taken off her.

VERITAS.

September 10, 1840.

ANCIENT CELLAR DISCOVERED.

Sir,—While my people were engaged in clearing an adjoining cellar, which had been used for many years in the wine trade, I thought from the sound it appeared to be hollow underneath; I accordingly had it opened, and found a beautiful arched cellar, about eight feet deep, built with red bricks, and what astonished me most (being a builder) was that the lower floor was composed of *good concrete*, made of gravel and lime, apparently just as we do at the present day. A great quantity of talc which had been used for glazing before the fire of London, a very large green glass bottle, holding about seven Imperial quarts, apparently of Dutch manufacture, and many curious things in use at that time, were found imbedded in the rubbish with which the cellar was filled.

I have no doubt but it is known, that talc pressed in a case made of iron, about 1 or 1½ inch apart, is a preventive from fire, and I have no doubt that fire-proof boxes might be made on this plan.

I remain, Sir,
Your most obedient,
JOHN WALKER.

No. 1, Crooked-lane, City, Sept. 10, 1840.

DR. LARDNER'S "STEAM ENGINE ILLUSTRATED." NEW EDITION.

Sir,—I have now before me one of the first numbers of Dr. Lardner's Steam Engine Illustrated, seventh edition, "enlarged and extended, so as not only to inform the practical engineer, but be a guide to all concerned in its

application to Navigation and *Railways*." Now at pp. 6 and 7 of this veritable guide, we find the following statements.

First, "a pound of coke burned in a locomotive engine will evaporate about five pints of water. In their evaporation they will exert a mechanical force sufficient to draw two tons weight a distance of one mile in two minutes."

In the very next paragraph is a matter of fact statement that, "a train of coaches weighing about 80 tons, and transporting 240 passengers, with their luggage,* *has been taken* from Liverpool to Birmingham and back from Birmingham to Liverpool, the trip each way taking about four hours and a quarter, stoppages included. The distance between these places is 95 miles. This double journey of 190 miles is effected by the mechanical force produced in the combustion of *a quarter of a ton of coke*, the value of which is six shillings."

Now, Mr. Editor, with your leave we will try how the latter agrees with the former statement, as it may perhaps assist in the due appreciation of the value of such a guide. One pound of coke will draw two tons one mile, *ergo*, 40 pounds of coke will draw 80 tons one mile; and of course, to draw the 80 tons 190 miles must take 40 × 190 lbs. = 67 cwt. 3 qrs. and 12 lbs.!! Further comment, at present, I think unnecessary, but you may possibly hear from me again (*i. e.* judging from such a begining) as I get further into the work.

Yours, respectfully,
TREBOR VALENTINE.

Derby, Sept. 3, 1840.

* According to my reading of the above. the weight of the 240 passengers and their luggage, wants adding to the 80 tons.

ELECTRIC TELEGRAPHS.

"Some Professors,
Are mere guessers."

Sir,—When men enjoy the title of *Professors*, we generally imagine they must be more familiar with the subject they *profess* than most other men who are in pursuit of the same object. A *Professor* should at least know every point of importance that has been suggested by theory and verified by experiments, in the science he pretends to understand. He may not have added one atom of original intelligence to the previous stock, but he ought theoretically to be acquainted with all established theorems, and practically to have proved their stated results to be correct or otherwise.

But when two *distinguished Professors* of the *same* science *differ altogether in their inferences and opinions*, they may both be wrong, but we are certain they cannot both be right.

Professor Wheatstone in his evidence on the subject of electric telegraphs, before the Committee of the House of Commons, says, "that electricity travels at the rate of 200,000 miles in a second. That he has every reason to believe he could communicate direct between London and Bristol, and in fact to any distance, if the wires be properly insulated. That it was formerly thought, to send a current of electricity to any considerable distance, very *powerful* batteries must be applied, but that he has ascertained a *very weak* battery is sufficient."

Professor Barlow, on the same subject, has observed, "it had been stated that an electrical discharge had been transmitted through a wire *four miles long* instantaneously and without any diminution of "intensity;" that he, however, by employing wires of various lengths, up to 840 *feet*, and measuring the energy of the electric action by the deflection produced in a magnetic compass, found, that the *intensity diminished very rapidly*, and was, in fact, very nearly as to the square of the distance inversely." Hence he concluded, "that the idea of making electrical telegraphs was *quite chimerical!*" He discovered moreover, "that though the effect was greater with a wire of a *certain* size than with one *smaller*, yet that nothing was gained by *increasing* the diameter of the wire beyond a *given limit*."

Here we have *two* scientific men, both theoretically and practically *Professors* of the same subject, yet both *differ widely* as to the nature, effect, and power of the galvanic fluid, and both positive as to the correctness of the results of their experiments. One declares that it travels 200,000 miles or *eight times round the world in a second*, and that he has no doubt he could send a communication 100 miles instantaneously and without interruption, if the wires were *insulated*, whilst the other Professor, who tries the influence to the extent of only 840 *feet* finds that the *intensity diminishes very rapidly!* What then must become of the *intensity* by the time it has travelled *a hundred miles?*

Professor Wheatstone finds that this fluid travels a hundred miles in the *two thousandth part of a second*, whilst Professor Barlow finds its intensity rapidly decrease in 840 feet?

It must require very nice calculation to determine that the electric fluid moves at the rate of 200,000 miles in the sixtieth part of a minute. If correct, we now only want the means of connecting the wires with the *moon* and we can communicate with its *inhabitants* in less than no time!

I do not see any difficulty in insulating the wires throughout the whole length of the Bristol Railroad. If small bars, with niches in their upper surface, were *run through the diameter of the pipes* at convenient distances, and the wires rested in *these*, they would be both insulated and supported, so that whether

they were carried forward in straight lines or otherwise, nothing could ever derange or destroy them, if properly coated and protected.

Being thus placed, I cannot conceive how the electric fluid, *once conveyed to the wire, could have its course arrested until it reached the extremity of the conductor*, whatever might be its length. Professor Barlow seems to think that it may arrive at a certain distance, become wearied and exhausted, and there *stop!* Impossible!

How also can Professor Wheatstone entertain the smallest doubt about the success of his telegraph between London and Bristol, when he tells us "it travels one hundred miles in the two thousandth part of a second?" Surely it cannot stop by the way in so infinitely small a period of time. If it does, what becomes of it—and if it does not, then what becomes of Professor Barlow's theory, which is totally opposed to such a result?

W. A. K.

P.S. A few weeks since Mr. Wigney *attempted* a reply to my objections against Dr. Black's theory of latent heat, by *reproducing the very inferences that I questioned.* This is an Irish mode of reasoning, and saves the trouble of *original thought;* I have as yet seen nothing in the shape of a rational answer to these queries, which were only intended to elicit investigation.

MR. ABRAHAM'S BALL COCKS.

Dear Sir,—I trust I shall not be offensive to your correspondent J + J, if I refer him to practice, and recommend him to renounce sketching. If, after J. + J. had made his first *sketches*, he had sought in the annals of invention, he would have found that Mr. Crookford's simple, double ball valve cocks opening outwards—and Mason's *single* ball valve, had already superseded the necessity of any further *sketching* for valves opening *outwards*.

Had J. + J., before he consigned my poor machine to the oblivion of the "common"—taken the trouble to understand the drawing which accompanied its description in your pages, he would have ascertained, that there is no "prolonged trickling" *to terrify those of a nervous temperament*, who sit with their ears under boilers; for the plain reason, that the water is not shut off at all until the supply is up to the nose of the cock. Then, as to chalk and water, and substances getting between the valve and its seat, with other requisite refinements, J. + J. should know the real use of a ball cock to the millions, and he would not trouble himself to polish and set such an instrument too exquisitely. The use of a ball cock is to insure a rapid and *certain* supply of water, under all seasons and circumstances; its perfection consists in the equitable performance of its office between the water company and the consumer. If a water company supply chalk, tadpoles, bull rushes and weeds, few instruments or constitutions will long tolerate the work. But of what consequence can be a few drops of leakage into a reservoir or cistern? There never was a cock made that did not either stick fast, or leak a little, under continued pressure. If J. + J. would try one of my cocks before he again ventures to disparage them, I think he might be inclined to mend his opinion. At any rate as he is a masked detractor he will forgive any want of complaisance in, yours truly.

Henry R. Abraham.

PEIRCE'S PATENT IDENTIFYING DETECTOR LOCK.

Locks known by the name of Detector Locks, have long been before the public; but as they merely apprize the owner of an attempt having been made to open them, without presuming to identify the guilty one, anxiety and suspicion are the natural results; and not unfrequently have the innocent been made to suffer with their unprincipled fellow servants. Such locks, therefore, often do more harm than good. To provide a remedy for this evil is the object of *Peirce's Patent Identifying Detector Lock*, which possesses an infallible means of condemning the guilty in his own person; thereby protecting the innocent from the hardship and baneful effects of a false accusation. The lock is upon Barron's excellent principle, with so large a number of tumblers, as to defy all attempts to open it with any other instrument than its own proper key. An attempt to unlock it with any fictitious instrument, instantly discharges the detector, one consequence of which is, that the operator is so effectually branded, for three or four weeks, that to avoid detection on examination is utterly impossible.

ROPE CUTTING MACHINE.

Sir,—I saw in No. 887, of your Magazine, p. 197, a letter from Mr. Smith, in which he makes mention of a machine for cutting rope, invented by the late Mr. Alexander Moody, of Dartford; and makes an inquiry respecting that, or any other machine at present employed for a like purpose. As I think such researches in a great measure help to improve our manufactures, I have much pleasure in publishing, through the medium of your valuable Magazine, a plan of one that I have seen worked both in Ireland and England for that purpose. Its construction is as follows:—

There was a metal fly-wheel about four feet in diameter, and three inches thick on

the rim, weighing between two and three cwt., fixed on an iron shaft which worked in brasses that were sunk in a solid timber frame. At the back of a fly-wheel, there was either a drum or spur-wheel fixed on the shaft, driven either by straps or wheels from the machinery of the mill. On the opposite side of the wheel in a line with the centre, and within three inches of the rim, were fixed two knives about nine inches long, four inches wide, and half an inch thick, with a bevil to one side of them, which was kept very sharp. On the top of the wooden frame there was fixed another knife, and before this knife a pair of rollers about nine inches long and one and a half in diameter, loaded with a weight at top. These rollers were driven by their connection with the mill work, and the speed was so regulated as only to admit a certain length of the ropes at a time; according to the length you wished to have the ropes, so you could regulate the speed; if the pieces were required to be half an inch long, of course the rollers should resolve slower than if they were to be twice that length. The fly-wheel made about eighty revolutions per minute. As it came round, the knives on its spokes met the ropes lying on the stationary knife and cut them off at the regulated distances. The fly-wheel was enclosed to prevent the ropes being thrown about. By this operation the rope was not only cut, but it was opened out, so that there was full a quarter of an hour gained in beating it into stuff in the engine. The same plan would answer for rags, I think, by having a canvas sheet passed over rollers fixed on the frame, with another roller placed at a certain distance from those on the frame to keep the sheet tight and level; on this sheet the rags might be laid; the rollers in revolving will drive the sheet on, and of course the rags with it, which by that means will be brought on the fixed knife and would be acted upon the same as the ropes.

I remain, your obedient Servant,

W. Pickering Phuir.

Butler's Town, Paper Mills,
Cork, Sept. 9, 1840.

THE THEORY OF LATENT HEAT.

Sir,—Your journal, so valuable towards promoting the arts, has done little or nothing, I perceive, in removing the errors with which modern philosophy abounds. The remark is suggested by a paper on "Latent Heat," which appeared in No. 889 of the present month. I could not help thinking, on perusing part of the same, how much deep thinking and brain racking is excited in statement, answer, and replication, when the object to be shown, proved, and disproved, is founded on principles at variance with the natural fact. How certain is the proposition, and concise the rationale, of anything which is according to Nature and reason! How is either party to convince the other, when the natural fact is unknown to both?

The celebrated *theory of latent heat* is downright absurd; what can be more so than heat not hot, which is equal to cold heat? But a word to the wise will settle all difference of opinion on the subject, and I trust make the truth have its proper value in accounting for the changes bodies experience by means of fire.

There is no such thing in all physical nature as physical heat, nor in creation as a hot body matter, therefore bodies cannot be made hot or cold by reason of their atomic substance being unalterable.

As well may we impute pain to the fire as heat; as well may we impute pain to the lancet, and sound to the metal of a bell, as insist that a body must be or have qualities similar to the sensations it promotes. Heat, equally as pain and sound, is but a sensation, and can no more belong to fire than sensitiveness to the fuel.

Substance, not heat, expands the thermometric fluid; physical force expands and contracts bodies, not temperature, heat, or cold.

Nor do we know heat, but as the consequence of the brain being excited by the contents of the nerves of sensation of the sense named the feeling sense. What, then, do we know but the resulting sensation? But we determine on the fire being hot by a sensation, which in itself is not hot! Whereas by the sensation we should infer that it is a substitute for the deficiency in nature of physical heat. As in the show-box, the printed landscape, said to be black and white, has the tint of summer, winter, autumn, or spring, according to the stained glass before our eyes, which is proof that the sensation or perception, colour, is what we know, not the print we think we see. So is it the sensation only with which we are acquainted, not the fire we feel. The mind only feels or perceives; all we know consists in sensations, with which their outward material causes can have no similitude whatever.

Should the foregoing meet the public eye, I am willing and ready to meet all objections, as well as to combat them, for the sake of arriving at truth.

J. H. Pasley.

Jersey, 31st August, 1840.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

Thomas Milner, Liverpool, Lancaster, safety-box manufacturer, *for certain improvements in boxes, safes, or other depositories for the protection of papers or other*

materials from fire.—Petty Bag Office, Aug. 26th, 1840.

In the ordinary mode of constructing fire-proof boxes, a space between the box and its outer casing is filled up with some good non-conductor of heat. The improvements comprehended by the present patent, consist in the addition of vessels filled with suitable fluids, by which the security is expected to be materially increased.

An iron box is to be surrounded by two or more external cases, having spaces between them, which are to have a series of tubes inserted, filled with an alkaline solution or other suitable fluid, the remaining space being filled up with good absorbent non-conductors, such as saw-dust, powdered charcoal, bone dust, &c. In case of fire, should the non-conductor, from the intensity of, or long continued exposure to heat, become so hot as to lose its protecting property, the boiling liquid will burst the vessels within which it was contained, saturate the absorbent substance which surrounds them, and enable it to resist the destructive influence of the fire; thereby preserving, uninjured, the papers or other valuables contained in the inner box.

The claim is for the application of vessels containing a liquid, in combination with the non-conducting materials, by which means the latter may be rendered humid in case of fire.

George Gwynne, of Portland-Terrace, Regent's Park, Gentleman, *for Improvements in the Manufacture of Candles, and in operating upon oils and fats.*—Enrolment Office, September 10, 1840.

This patentee claims 1st, the mode of refining fats and oils by means of carbonated alkalies, in order to obtain common candles of a better quality than is now made, and improved oils. 2. The distillation in vacuo of all fatty and oily matters, and all bodies derived from them directly or indirectly, by means of any agent or agents, or by any process or processes. 3. The distillation, and when requisite the repeated distillation, under atmospheric pressure, of fatty acids and their products, and also of fatty or oily bodies obtained from those bodies commonly called soaps, when such soaps have been submitted to distillation under atmospheric pressure. 4. He claims the mode of separating the fluid from the solid part of fats and oils, by taking advantage of the different degrees of solubility which such bodies offer when converted into salts. The several methods of conducting these various processes are set forth at so great a length in the specification, as to render it very difficult to give any very satisfactory idea of them, within the limits of such an abstract as our space compels us to observe.

The mode of refining fats by carbonated alkalies is as follows: Into a vessel of suitable dimensions, the patentee puts 220 Imperial gallons of cold water, and 280 lbs. of carbonate of potassa. Carbonate of soda may be used, but in that case 560 lbs. will be necessary. Steam is then admitted through a perforated pipe, which raises the temperature of the solution; when it boils, 20 cwt. of tallow is added, and the boiling continued for eight hours. The steam is then turned off, and the mixture left to cool till next day, when the water and carbonate of potassa (which is termed "lye") settles to the bottom and is drawn off by a cock provided for that purpose, to be used over again. The tallow, which has a soapy appearance, is transferred to an iron vessel provided with a steam jacket, and 280 lbs. of carbonate of potassa being added, it is heated to 110° of Fahrenheit; in this state it is to be continually stirred either by hand or by machinery, as the success of the operation depends upon the complete and intimate incorporation of the ingredients. The temperature is to be increased until the mixture is heated 200°, when the steam is to be shut off; the mixture is to stand to cool for 12 hours, when it ceases to be soapy, but in order to make the tallow bright, it is again heated to 200° in another vessel. Rape and whale oil are to be refined in a very similar manner, only they require from a month to five weeks to settle down bright.

Another mode of freeing tallow from its impurities, is by adding ½th its weight of concentrated sulphuric acid; the tallow should be heated to 105°, and the acid stirred in very slowly; at the end of about an hour and a half, the acid may be washed off by the addition of water. The distillation of the fatty acids (to be obtained in the usual, or other convenient manner) in vacuo, is conducted in a manner similar to that, so long successfully employed in sugar refining. Stearine wax is vaporized at 350° of Fahrenheit, and boils violently at 500°; that point, therefore, is not to be exceeded. In order to regulate the temperature with facility, the grate containing a coke fire is supported by a rack, in which a pinion works, connected with suitable gearing for raising or lowering it, causing it to approach to or recede from the pan, according as the temperature requires to be increased or diminished. Distilled oleic acid, on cooling contains a considerable quantity of solid fatty matter, which is separated by the following mode of filtering:—A filter is made of a cylindrical bag of drilled cotton 6½ feet long and 6 inches diameter, enclosed for strength within a similar bag of strong linen; one end of the bag is attached to a pipe proceeding from an elevated cistern, the lower end is closed by being tied round a wooden plug. The fluid being admitted filters through the bag by means of the pressure from the cistern, and the solid stearine or fat is collected with-

in the cylindrical bag; when this is full, the plug is withdrawn, and the solid matter squeezed out. A number of these filters are attached to a long range of pipes, and operate simultaneously on a large quantity of the oleagenious fluid.

James Hadden Young, of Little France, merchant, and Adrien Delcombe, of the same place, manufacturer, *for an improved mode of setting up types.*—Enrolment Office, Sept. 12, 1840.

The apparatus which forms the subject of this patent, might aptly be called the *mechanical compositor;* its construction displays great novelty and ingenuity, though necessarily too complicated, for the details of its construction and operation to be made intelligible, without the aid of drawings. It consists, however, of a strong frame or stand, with a horizontal bed-plate about the middle; supported above, there is (answering to the printer's chase) a series of receptacles for types, formed of parallel brass bars placed one above the other, corresponding with the two inclined planes on which they rest, which are in the form of a pointed roof. These inclined planes are of iron, having ribs cast on the under side, so as to make them strong enough safely to support the superincumbent weight of the types. Upon the bed-plate, in front, there are three rows of keys, above and behind each other, like organ or piano-forte keys, corresponding in number with the cavities or receptacles above. The uppermost row of keys, twenty-six in number, are devoted to the capital letters: the lowest, are the small letters, while the intermediate row consists of the double letters, stops, spaces, &c. &c. Each key is distinctly marked with the particular letter or character to which it appertains. From the keys proceed long levers, extending to a peculiar piece of mechanism, the office of which, on a key being depressed, is to displace one corresponding piece of type from its receptacle. On being displaced, the type immediately falls into a groove on the inclined plane, down which it slides by its own gravity, till it reaches the central point, where there is an ingeniously contrived joint which guides it into the composing-box where the form is to be set up. An arm projects from the inside of the lever of every key, so that when a key is depressed, a little pushing apparatus is made to act upon the types in the composing-box, urging them forward the space of one type, so as to make room for the reception of the type that is at that moment in the act of descending. From this brief description of the apparatus, it will readily be perceived that the operation of "composing" is thus rendered a very simple affair. The types being in the first instance uniformly arranged side by side, nicks upwards, in their respective cavities, the compositor has only to take up his "copy," and touch the proper keys in due order, when the *types set themselves up* with precision and despatch. The rising of a small rod shows the completion of a line, when the workman turns a handle once round, which advances the composing-box so as to receive the next line of types in their proper places. The whole of the arrangements appear to be very complete, and only want the addition of a mechanical "*Reader,*" to make them invaluable.

The claims made are as follows:—1. The use of an inclined plane for setting up printing types, by the inclination of which plane, the types placed thereon, in whatever manner, are caused to slide by their own gravity to a given point, whether such point be the required position in the composing-box, or receptacle answering the purpose of the composing-stick. 2. The particular form and arrangement of this elevated receptacle, or chambers, for the types. 3. The pushing frame and wedge shaped pieces, by which the types are placed on to the inclined plane. 4. The hinge joint, by which the types are conducted into the composing-box. 5. The composing-box and the various mechanical movements connected therewith. 6. The shields which prevent the escape of the types out of the grooves, and off the inclined planes.

PROPOSED IMPROVEMENTS IN LIGHTHOUSES. BY CAPTAIN BASIL HALL, R. N.

(From the United Service Journal for September.)

It is well known to all who have navigated our coasts, or those of any other country, or who have studied the matter carefully on shore, that the brilliancy, or effective intensity, of the light in a revolving lighthouse is many times greater than that of a fixed lighthouse, or one which is required to illuminate equally every part of the circuit of the horizon. This immense superiority is derived from the circumstance that, in a revolving lighthouse, the rays from the lamp, or lamps, are concentrated into a certain number of portions, say four or five, which accumulated or condensed portions possess, of course, a greater degree of brilliancy than if they were dispersed uniformly round the compass. In the French lighthouses, on M. Fresnel's plan, of the first class, the light, which is derived from one immense central lamp, furnished with four concentric wicks, is concentrated, by eight large polyzonal lenses, into as many pencils or portions of rays, each having a divergence of about 6°. The effect of this arrangement, it will easily be understood, is to illuminate, very brilliantly, eight different parts of the horizon, each being about 6° in breadth, while all the rest of the circuit is left in total darkness. Thus,

while about 48°, or say 50°, of the horizon are lighted up, the remaining 310° must be left without any rays at all from the lighthouse, the whole being concentrated and directed towards those eight small spaces only. By the slow rotation of this system of lenses, every portion of the horizon comes, in succession, to have the concentrated light refracted to it through the lenses. This is the revolving light of the French, on the dioptric, that is, the refracting system.

If, instead of lenses, a number of sets of argand lamps, with parabolic reflectors, be placed on the sides of a revolving apparatus, a series of spaces in the horizon would, in like manner, be lighted up in succession, with a degree of brilliancy proportionate to the number of lamps placed on each face—while all the rest of the circuit would, as before, be left in darkness. This is a description of the ordinary revolving lighthouse of the English, on the reflecting or catoptric plan. Of these there are several varieties, depending on the velocity of the rotation or the colour of the light, and on other circumstances which need not be adverted to.*

The great desideratum, as I understand it, is how to acquire for a fixed lighthouse the same degree of brilliancy, without intermission, from whatever quarter it be viewed, that a revolving lighthouse does when each of its concentrated pencils of rays falls successively upon the eye. Hitherto this problem has baffled even the ingenuity and resources of Fresnel. That distinguished philosopher has, however, been the means of greatly increasing the brilliancy of fixed lights, by suggesting the following adaptation of the dioptric, or refracting principle, in the manner first practically exhibited at the Isle of May. By a system of horizontal hoops, or what may be called bent prisms, those rays which would otherwise be lost in the sky above, or be wasted on the surface of the sea, are refracted into the horizontal direction and sent towards the horizon. Still it must happen, even by this ingeniously-devised arrangement, that by reason of the rays of light not being concentrated laterally (as in the case of lenses), but diverging from a central point, the loss of light, as the distance of the spectator increases from that point, is inevitably very great. The same thing must happen when lamps and refractors are used instead of lenses; for, in whatever order they are distributed round the cylinder, still if all parts of the horizon are to be lighted equally and at the same moment, there can be no concentration of light in one direction without a loss to some other parts. Moreover, as the distance of the spectator increases, the light which diverges from a central point must always rapidly diminish in quantity. Now, it is most important to recollect, that this rapid diminution does not occur when the light, by being concentrated by lenses, reaches the eye in rays nearly parallel, no matter whether the spectator be at a distance or near at hand.

Such, then, being the acknowledged superiority in the brilliancy of revolving lighthouses, both as a matter of theory and of universal observation, it occurred to me as worthy of trial, whether, if a light of this description were made to revolve rapidly instead of slowly, such a degree of continuity might not be obtained as to give, to all sense, the appearance of a fixed light, which should be equally and constantly visible in every direction round the horizon, so as to exhibit,

* The following memorandum shows the relative power, or brilliancy, of the dioptric, or refracting method of concentrating the light used by the French, compared with the catoptric, or reflecting method, generally used in England. It further points out the enormous superiority—so far as brilliancy is concerned—of a revolving lighthouse, over that emitted from one that is fixed—the reason of which I have already explained.

The maximum effect of the revolving light, on M. Fresnel's principle, that is, of a lighthouse fitted with his great lenses, has been ascertained to be equal to the light of 3150 argand lamps.

In a revolving lighthouse of the first class in use in England, that is to say, having in each of the four faces six lamps, furnished with parabolic reflectors, the power of the light sent off to the horizon, as the lighthouse revolves, is, at its maximum, equal to that of 21000 lamps.

But when we come to the powers of a fixed light the falling off is immense. The effect of an argand lamp, placed in the focus of a parabolic reflector, and viewed in the direction of its vertex, or at its maximum of brilliancy, is only equal to that of 350 lamps! So that, at the very best, a fixed lighthouse can never show more than one-sixth as much light as one that revolves on the English system, nor more than one-ninth as much as one that revolves, and is furnished with lenses, on the French system. This prodigious difference in the brilliancy of revolving and steady lighthouses is not matter of speculation, but of direct experiment, and is only too well known to navigators.

In speaking of the effect, or power, of a reflector, in a fixed lighthouse on the English plan, I must beg leave to recall to to the reader's recollection that in such a lighthouse the intention of illuminating the whole circuit of the horizon is, at best, imperfectly accomplished, inasmuch as the whole number of lamps and their reflectors, say twenty-four, must be so distributed as to afford each degree of the compass, as nearly as possible, the same amount of light. Now, it unfortunately happens that when a lamp, placed in the focus of a parabolic reflector, is viewed from any direction but from the point exactly opposite to it, that is, in its vertex, a great loss of light takes place. Suppose the light of such a lamp, in the focus of a reflector, when viewed in its vertex, to be equal to 350 lamps.

But the light when viewed	2°	on one side of the vertex of the reflector, it is equal only to	335 lamps
" "	3°	" "	255 "
" "	4°	" "	150 "
" "	5°	" "	60 "
" "	6°	" "	15 "

So that, if twenty-four lapms, in the foci of so many reflectors, be ranged round a lighthouse, only twenty-four separate points of the horizon can by possibility enjoy a light equal to that of 350 lamps, while all the rest of the circuit must enjoy less in proportion to their distance from the vertex.

permanently, that brilliancy which an ordinary revolving lighthouse gives only in flashes.

From the familiar experiment of whirling a lighted coal round the head, as well as from the more elaborate experiments of Professor Wheatstone and others, it was well known that the continuity of light alluded to might be obtained—but, then, two practical questions of some importance arose. First, whether or not the degree of velocity requisite to produce an apparently continuous light could be obtained by the rotation of any system of lenses of the size and weight suited to lighthouse purposes? and secondly, whether, supposing such velocity to be practicable, there might not be such a diminution of the light, caused by this quick rotation, as to render the method of obtaining fixed lights useless in practice?

It was imagined by some persons that if a lighthouse, fitted with eight lenses for instance, were put into such rapid revolution as to bring the flashes emitted by them in quick enough succession on the eye to produce the appearance of continuity, the effective brilliancy might be lessened by the admixture of an equally quick succession of the eight dark spaces in the circuit. For said they, it must be recollected that the eight lenses illuminate only about 50 degrees of the horizon, while they leave 310 degrees in darkness.

On the other hand, it was conceived by persons who had experimented on the duration of impressions made on the eye, that the sensibility of the retina might be so augmented and kept in activity by the irritation of constantly recurring flashes, that no loss, or no great loss, of apparent intensity would result from the successive interposition of the dark spaces occurring between the flashes.

At all events, as the opinions of the most experienced men were divided on these points, it became evident that nothing short of actual experiment could settle the question, and I resolved to apply to Government for assistance in conducting a series of trials with an experimental lighthouse. I accordingly wrote to Captain Beaufort, Hydrographer to the Admiralty, who so far approved of the suggestion that he considered it worthy of trial. But, on bringing the subject to the notice of the higher authorities, the scheme was not thought so well of. Their Lordships, however, on my application, allowed me the use of the Laboratory establishment at Portsmouth: and this, certainly, was all I could reasonably expect; for it is manifestly impossible for Government to assist the crude speculations of every theorist, however ingenious or promising he may consider them.

Circumstances did not enable me to take advantage of this permission till some time afterwards, when I went to the expence of erecting a frame-work at Portsmouth; and having received from Mr. W. J. Cookson, of Newcastle (of whose liberality in the advancement of optical science I cannot speak too highly), a series of lenses one foot in diameter, I made a few experiments which gave me considerable hopes that the scheme might prove advantageous to the science of lighthouse illumination.

It was not, however, till late in the year 1839 that I had it in my power to resume the consideration of this topic. The Board of Ordnance having been kind enough to allow me the use of a long room in the Tower, called the "Train of Artillery," I erected at its western end the same machinery which I had formerly constructed at Portsmouth. With a view also to these experiments, the Commissioners of the Northern Lights had the goodness to entrust to my care one of their lamps on M. Fresnel's plan. On proceeding to work, I found that some considerable modifications were necessary in order to adapt the machinery to the use of this huge lamp. This caused some delay, and it was not till the 28th of January, 1840, that I was enabled to try any regular or satisfactory experiments.

[Captain Hall then describes the construction of the apparatus he employed, after which he thus proceeds.]

In the first place, it was clearly established, that when this lighthouse carrying 8 lenses made 40 revolutions in a minute, the velocity was sufficient to produce to the sense of sight a perfectly continuous light. It must be understood, that when this light was viewed from the short distance of 345 feet, though it was quite continuous, it was not by any means steady, but trembled violently. I have no doubt, however, from the previous experiments which I made with the same apparatus at Portsmouth, that, at distances greater than a quarter of a mile, the light produced by this degree of rapidity in the revolution of the 8 lenses would appear quite as steady as that of a star of the first magnitude, which, it may be observed, though it twinkles, is quite continuous in its effect—just as the light of a candle is continuous, though it be waved about from side to side.

When the lighthouse made 60 revolutions in a minute, or once in a second, the light certainly appeared more steady, but it was not more brilliant; and it would seem from this, that a greater rapidity of rotation than is just necessary to produce apparent continuity does not add to the brilliancy of the light.

NOTES AND NOTICES.

The Roller and Belt System of Tanning, patented by Messrs. Herapath and Cox, was exhibited in the Backhall, (at the late Bristol leather fair.) There were two pairs of large rollers, and a small model. Crowds of tanners filled the office, closely examining the machines, and the numerous bales of butts and dressing leather, tanned by it in various parts of England and the Continent. Very general admiration was expressed at the quality of the samples, and the state of the Nailsea Tanyard, which had been thrown open to the inspection of the trade by Messrs. J. and S. Cox. Many tanners, who are working under the patentees, attended, and expressed warmly their satisfaction. Butts of 45 lbs. were stated to have been tanned in four months, and German calf skins in twenty-six days. The general opinion seemed to be that a most important improvement had been made in the art, calculated to lessen the capital, reduce the cost of tanning, as well as to improve the quality of leather. We perceive, from the circular of the patentees, that it is becoming very general, and we congratulate Bristol that so important a discovery has been made by one of her citizens.—*Bristol Mirror.*

Wood Paving in the City.—On Tuesday week Sir Burgess Camac waited on the Commissioners of Sewers, at Guildhall, for permission, as chairman of the Metropolitan Wood Pavement Company, to lay down the wood paving of that company in some part of the city. The Commissioners gave permission for an experiment to be made opposite Cripplegate Church, from Jewin-street to Whitecross-street. Mr. Stephen Geary also made a similar application, on behalf of the General Wood Paving Company, and obtained permission to lay down 300 yards, opposite St. Catherine Cree Church, in Leadenhall-street.

Flying Dick.—One of the engine-drivers of the Hull and Selby Railway Company, who has conducted engines for many years, both in England and Brussels, is said to have travelled faster than any man besides himself, in making experiments with the engines; and he now volunteers to travel 100 miles within the hour, whenever one of the railway companies think proper to risk their engine for that purpose.—*Hull Packet.* Flying Dick is not, however, without a rival; Mr. Brunel having wagered £1,000 that, on the completion of the Great Western Railway, he will travel from Bristol to London in *two hours!*

Submarine Operations.—Spithead has been, within the present week, a scene of diversified exertion in sub-marine work. Colonel Pasley has been prosecuting his operations on the *Royal George* and the *Edgar*. Mr. Abldnett his on the *Boyne*, and Mr. Deane and Mr. Edwards their most interesting works on the wreck of the *Mary Rose*, sunk in the reign of Henry the Eighth. The *Mary Rose* lies in about eight fathoms of water, and not very far from the *Royal George*. Mr. Steele, of the County Clare, in the prosecution of his new principle of submarine illumination of objects in dark and muddy water, has been this week down on the wreck in Mr. Deane's water-tight dress and diving helmet, making some observations and experiments. A diving bell is, we understand, preparing under Colonel Pasley's orders, to be used in his operations on the *Royal George.*—*Sun.*

Marsh's Apparatus for Detecting Arsenic is of the most astonishing sensitiveness for the detecting of arsenic in the minutest quantities submitted to its action; so much so, that Mr. Marsh himself, by a modification of his process, has detected the presence of this poison when operating upon only one drop of arsenical solution, containing the one hundred and twentieth part of a grain of arsenic. The principle upon which the apparatus is framed is this—that hydrogen gas has to be formed in the midst of the matter suspected to contain arsenic; that this gas is to be burnt on coming out of the apparatus; and then that the products of this combustion should be examined. One of the principal properties of arsenic is to form a gaseous combination with hydrogen, of an excessively deleterious nature, called arsenicated hydrogen; it burns in this form just like common gas, and leaves as a residue a brown solid matter, or a sort of metallic soot, which is, in fact, the hydrurate of arsenic. If, after the gas is set on fire, a piece of glass is presented to the flame, the combustion is thereby retarded, and there is deposited on the glass a circular zone of metallic arsenic. In Marsh's apparatus a small glass tube is used, and on the inflamed gas being admitted into it, there is deposited, if the gas contains any arsenic at all, first, metallic arsenic at the part of the tube in contact with the flame; secondly, white arsenic or arsenical acid a little higher up the tube; thirdly, a strong smell of garlic, the arsenic smell, at the other end of the tube. It is an apparatus of this kind that has been used in the experiments by the chymists at Tulle, in the case now pending of Mad. Laffarge. Since, however, this method detects arsenic in such exceedingly small quantities, it becomes liable to objections when used in cases of forensic medicine. Thus the zinc employed to make the hydrogen gas may itself contain arsenic, as it nearly always does in small quantities; the sulphuric acid employed for the same purpose may contain arsenic, as the English acid nearly always does; and, in short, the most extreme care is requisite in discriminating as to what source the arsenic comes from, when its presence is detected by the apparatus. When, however, Marsh's method fails in detecting any arsenic at all, it may be taken as a most positive test that there is no arsenic whatever in the substances examined.—*Galignani's Messenger.*

Fire Escapes in the City.—The Police Committee met at Guildhall on Thursday last, at eleven o'clock, for the purpose of examining the various fire-escapes submitted to their notice. D. W. Harvey, Esq., Chief Commissioner of Police, was present, and the Committee had obtained the attendance of Mr. Braidwood, Superintendent of the London Fire Establishment, to assist them in their investigation. Amongst those present we noticed Mr. Baddeley, Mr. Gregory, Mr. Hudson, and several other old and well-known labourers in this vineyard of humanity: as well as a large number of candidates of more recent standing. The various plans of upwards of five-and-twenty persons were minutely examined, which occupied the attention of the Committee till 5 o'clock, when they adjourned. Some of the models were exceedingly well executed, particularly one exhibited by Mr. Stanley, which consisted of three sliding ladders, upon Gregory's patent principle, mounted on a light carriage or truck, all the details of which displayed great ingenuity, and the contrivance was very favourably received. Merryweather's portable fire-escape ladders were exhibited to the Committee by Mr. Baddeley, and their several advantages clearly pointed out; their superior fitness for the intended purpose was pretty generally admitted, and there seems to be but little doubt of this apparatus being adopted. The same gentleman exhibited, and explained at some length the action of Capt. Manby's antiphlogistic vessels, for the suppression of fire, the novelty and ingenuity of which excited much interest. The prevailing defects in many of the contrivances brought forward on this occasion was, as usual, a want of simplicity and portability—points very wisely deemed to be essential to the efficiency of a fire-escape.—A. W.

The Ancient Mariner.—Sir,—In your last number of the *Mechanics' Magazine*, in noticing the departure of the *Vernon*, you attribute the poem of the "*Ancient Mariner*" to *Southey*, whereas, it was written by the late poet *Coleridge*. I have the honour to be, Sir, your obedient servant, E.C.

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MR. SAMUEL SEAWARD'S REGULATING GEARING FOR STEAM-ENGINES AND PADDLE-WHEELS.

Fig. 1.

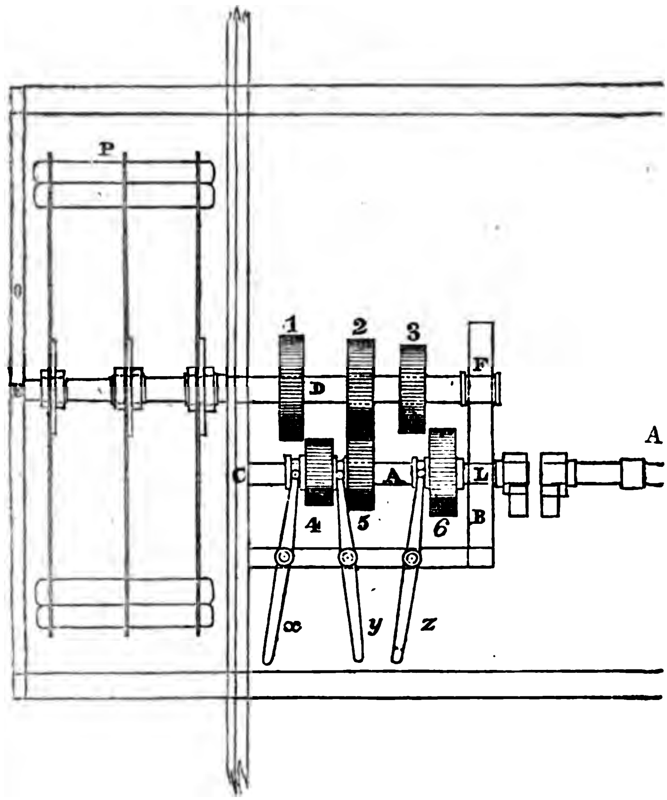
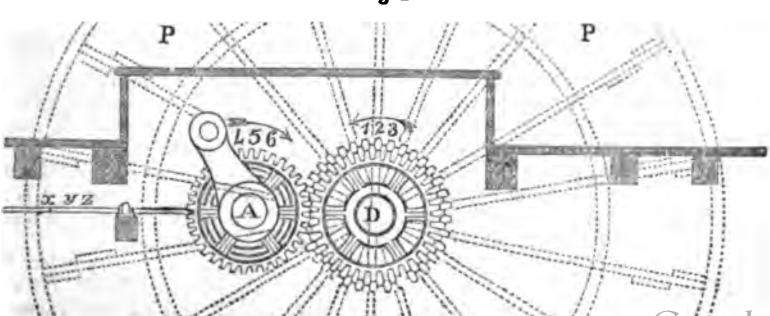


Fig 2.



MR. SAMUEL SEAWARD'S PATENT IMPROVEMENTS IN STEAM ENGINES, AND IN THEIR APPLICATION TO PROPELLING PURPOSES.

(Second Notice.)

The second of Mr. Seaward's improvements consists in a method of reducing or augmenting the speed of the paddle-wheels of a steam vessel, acording to the degree of resistance they have to encounter, while the engines are always kept up at their maximum effective speed, and also of promptly disconnecting the paddle-wheels altogether from the engines, whenever that may be deemed expedient.

A transverse view of the arrangements by which these important effects are obtained is given in Fig. 1, and an inner side view in Fig. 2; that is to say, *half* views only, the reader being to understand that the same arrangements precisely which are made for one engine and wheel, are repeated with respect to the second engine and wheel, on the opposite side of the vessel.

A A is half of the line of main shafts of the engine, which, instead of passing through the ship's side to the spring beams (O), terminate on each side at bearings (C) in the sides of the ship; D is the paddle-shaft, placed parallel to the main line of shafts A A, and at some distance from it (either before or abaft, above or below it, according as circumstances may render advisable,) and extending from the bearing E on the spring beam O to a bearing F on the main frame B of the engine. On the line of main shafts are affixed three moveable driving pinions, 4, 5, and 6, which are of different diameters, and when in gear, work into three spur wheels, 1 2 3, which are made fast to the paddle-shaft; *x*, *y*, or *z*, are clutch handles, by which the moveable pinions, 4, 5, and 6, may be thrown in or out of gear at pleasure. In this way the engineer is enabled to drive the paddle-wheel P at three different rates of speed, according as one or other of the pinions is in gear. When the immersion of a vessel and the state of the weather are such, that every stroke of the engine can produce a corresponding revolution of the paddle-wheels, then the pinions 6, and wheels 3, which are of equal diameters, are put into gear, and the engine and wheels work at precisely the same speed (say, for example, 20 strokes each). But supposing that either from increased draught of water or from opposing winds, the wheels cannot be kept up to the same speed as the engines, then the pinion 5, and wheel 2, which are in the proportions of 17 to 20, are brought into gear, and the others thrown out of gear, the effect of which is, that while the engines continue to make their 20 strokes as before, the number of revolutions of the wheel is reduced from 20 to 17. Should the speed of the wheels become still further reduced by greater draught of water, or more adverse gales, recourse is then had to the pinion 4, and wheel 1, which are in the proportion to one another of 14 to 20, by which means the number of revolutions of the wheels are reduced in the same proportion.

By this ingenious and skilful method of adjusting or proportioning *the work* to *the power*, and protecting the engines from the re-acting influence of the encreasing resistance to the rotation of the wheels, the maximum of useful effect of which they are capable is obtained from them—that is to say, the engines continue to perform always the same number of strokes nearly per minute, though the number of revolutions of the wheels per minute may be diminished from 20 to 17, and again from 17 to 14; whereas but for the employment of gearing in the manner we have described, not only would the encreasing resistance to the rotation of the wheel have brought down the speed of the engine, and that at times when it is of the utmost importance they should possess their greatest effective power, but the revolutions of the wheel itself would be reduced in number much lower than even the lowest of the numbers represented by the driving pinions.

The time occupied in throwing one set of pinions out of gear and another into gear, need not, the patentee states, exceed two or three minutes.

When it is desired to suspend the use of steam power altogether, all that is required to be done is to throw the whole of the pinions out of gear.

In adapting the machinery before described to the three different rates of speed of 20, 17, and 14 revolutions of

the wheels per minute, Mr. Seaward states that he has considered that these are the rates most required to be provided for in the ordinary practice of steam navigation, but that any other rates of speed, and also any greater number of rates than three, may be provided for by adopting different proportional diameters for the wheels and pinions, and by multiplying the number of pairs or sets employed.

PRACTICAL REMARKS ON THE ART OF SCULPTURE.

Sir,—In the 68th Number of the *Magazine of Science*, I find an article on Mr. Behnes's sculptor's pointing instrument, and an attempt to describe the modelling of a bust. The author has made sad work of the affair from begining to end—so much so, indeed, that it would appear almost unintelligible to the general reader.

The author asserts, that "the sculptor makes a model in common wetted pipe-clay." It is almost impossible to work with freedom, ease, and rapidity, in pipe-clay, and the sculptor never uses it for busts, statues, or large works. The substance employed by sculptors is the brown Dorset clay,* with a larger portion of fine sand, well mixed, beaten or *pugged* together, until the laminæ (strata or beds found to exist in native clay) become entirely destroyed, without which no artist can model with facility.

Again, it is stated that "it is at the *first sitting* that the size and attitude of the model is decided upon. The model is covered with a wet cloth, and this is necessary at all times throughout the whole process, for two reasons. 1st. Because the clay can only be worked when wet; and, 2ndly, if suffered to become dry, it would shrink and crack, and thus afford no criterion afterwards of its original dimensions."

The *size* is generally fixed on at first, but the *attitude* changes as the artist advances with his work; and for this very purpose Mr. Wm. Behnes and others use a *stem* with a ball and socket-joint, (sometimes two,) in order that the attitude may be varied without difficulty. Attitude and expression are so strictly connected with each other, that the character of the whole mainly depends on the fitness of both, and it is on these that the artist may confidently rely for the successful effect of his bust, statue, or group.

Again, "The CLAY *model* is mounted on a block of wood or stone, and is so placed that the foot or board on which it rests is capable of carrying it round an axis." The *clay* model is never used as a guide. If fixed on the *pointing scale-stone* it must be necessarily left to dry, and subject every moment to injury. Taking the average, sculptor's clay contracts about $\frac{9}{16}$ of an inch per foot in drying, and if suffered to become dry it would shrink and crack, and afford no criterion afterwards *of its original dimensions*. It must be self-evident, therefore, that the form and size of the model is preserved, and a plaster of Paris mould secures everything. After the clay has been pricked out of the waste mould, the mould well washed, and allowed to absorb as much water as possible, liquid plaster is poured into it, and by rolling the mould, in the same manner as you would a basin half filled with cream with the intention to cover every part, the liquid plaster flows equally over the surface of the mould, leaving a thickness of ½ inch, less or more. This process is repeated a second and third time, until the whole becomes about 1½ inch thick. The waste mould is now chipped off with a mallet and *blunt* chisel, by a practised hand; the mould and the casts not adhering together, owing solely to the absorption of water by the former, which I mentioned before.

The *plaster cast*—not the *clay model*—and blocks of marble are now placed on two separate scale-stones, the dimensions and quality of the marble ascertained, and, when once adjusted by the workman, are firmly fixed with plaster of Paris to the stones, and never moved until every *point* has been correctly taken. It is true that the bench or stand on which the scale-stones rest may be made to turn round on fixed axis and circles of metal rollers, but this is not necessary. The pointing instrument and scale-stone being inseparable as to individual motion, have nothing to do with the rotary movement of the bench or stand, and neither large nor small works in sculpture require this

* May be obtained at Messrs. Bloodworth's Brown Stone Pottery, Lambeth, price 3s. 6d. to 4s. per cwt.

motion for any other purpose than the convenience of light.

Lastly, we are told to "proceed in taking points until a sufficiency of measurements *have* been taken, and the marble bust will, *of course*, (!) have been gradually hewn into the required likeness, making the whole art of sculpture a mere mechanical operation." The process of pointing is mechanical, but the moment that process is completed, the marble bust in embryo is placed in the hands of the marble carver, on whose judgment, taste, and experience, the beauty of the work, executively, entirely depends. The transparency of marble (in itself the sole cause of that delicate softness so much admired by the lovers of sculpture "for its own dear sake") renders it necessary to TREAT the cutting of the marble in a peculiar manner. When finished, the marble is no longer *the same* as the model; neither ought it to be so, opaque and partially transparent substances requiring different treatment in detail. Place the original plaster cast alongside of a cast taken from the finished marble bust, and you will at once perceive a difference,—by no means favourable to the latter.

Composition, character, and just proportion, form the highest qualities of the modeller's art, and without these no carving will ever render any works perfect as a whole. Yet it is unjust and incorrect to assert that the whole process of sculpture is a mere mechanical operation, and proves that the author of the article referred to, possesses a very superficial knowledge of the subject. With as much truth might it be asserted that engraving is a *mere* "mechanical" operation—yet how far from the fact! No man can carve well who is incapable of modelling; and the best carvers, so far as opportunity permitted them, have attended and studied the art of modelling the human form in the Royal Academy. He who can command a salary of 250*l.* to 1,000*l.* per annum will be found by no means a mere mechanic. The modeller and the carver are almost inseparable, and the establishments of our popular sculptors satisfactorily bear out the assertion. The names of Carew, Theakstone, Heffernan, Physic, Gahagan, &c. &c., though in a great measure unknown to society at large, are familiar to artists generally; and our two most distinguished sculptors, men of unsullied reputation—Chantrey and Westmacott—have borne testimony to the truth and justice of my assertions.*

There are several differently constructed pointing instruments made use of by sculptors, all more or less applicable to the purposes required. That by Mr. Wm. Behnes is a good one for busts, yet after an existence of nearly twenty years it is rarely found in use—a sufficient proof that the superiority of its construction exists, if at all, more in imagination than in reality. I beg to refer your readers to the establishment of Sir Francis Chantrey, where the most extensive apparatus will be found in active use, and every explanation given with the greatest willingness and courtesy.

MONTAGUE.

August 26th, 1840.

ELECTROTYPE.

Sir,—In No. 892 of the *Mechanics' Magazine* there is a notice that Mr. Joseph Shore, of Birmingham, has taken out a patent for covering metals by precipitation!

It would have been just as modest if the said gentleman had taken out a patent for making apple dumplings, stating that "*he did not limit himself to the precise mode of making them, but that it is convenient*" to wrap the dough around the apples, &c.

Mr. Shore must be fully aware that from the moment Messrs. Jacobi and Spencer introduced this subject to the world, *hundreds* have been engaged not only in *covering metals by precipitation*, but in covering innumerable other articles made of *non-conducting* substances, previously metallised for the purpose.

These operations have been fully discussed in the papers and other periodical publications for many months past, and the results are as notorious as the sun at noon day.

I have been actively engaged in the same process for some eight or nine months, during which period I have covered with copper, precipitated, scores of fancy articles and ornaments, made of almost every variety of substance, independently of producing fac-similes of

* Vide pamphlet report of trial, Carew *v.* the Executors of the late Earl of Egremont.

some very large and highly finished copper-plate engravings.

The apparatus which Mr. Shore describes for effecting *his* purpose, has actually been employed in *similar operations* for some nine months at the *Polytechnic Institution, and there daily exhibited to the public.*

The fact is, that Mr. Shore is no more entitled to the merit of inventing the galvanic battery he mentions, nor any other electrotype machine, nor of precipitating copper through its medium on metals, nor on any other substance, than the man in the moon! What will persons have the assurance to patent next?

W. A. KENTISH.

NEW SYSTEM OF MANAGING THE SAILS OF VESSELS.

Sir,—Having given up much of my attention to the best mode of setting the sails of vessels, so as to give them, especially in working to windward, the greatest impulse; and having succeeded, through the aid of my patent revolving mast, beyond my original most sanguine expectations, I thought at one time nothing more was to be accomplished in that way; but in spite of that, an idea intruded itself, that it was possible to set sails in such directions, that as far as regarded the action of the wind upon them, independent of their weights, and those of the masts, and spars to support them, they might be so neutralized as not to effect a vessel's stability.

In order to put my idea to the test, I first made an experiment by hanging a mast upon pivots, with a heavy weight fixed to its lower extremity; then, by means of an out-rigger, I placed a sail at different angles, and found that I could, by altering the angle of the plane of the sail, either cause the mast to heel to windward, or to leeward, or even balance it, if the wind were quite steady.

The success of this first experiment induced me to try it on a little model vessel, which further proved my idea to be correct, as I could at pleasure make the vessel heel or upset, either to windward, or to leeward, or to sail upright—always in the latter case the wind blowing steadily in an horizontal direction. The fact of a vessel being able to sail [illegible] in smooth water, with a strong wind up[illegible] beam, thus being established, it remain[illegible] seen what advantage may be practically derived from it. At first I was overjoyed and very sanguine about it, from the idea of the enormous sheet of canvass which might be displayed to propel a vessel; but I soon discovered that the additional weight of spars required to give the sails their proper angle of direction amounted, in a great degree, to a prohibition of that display; and, besides, in order to answer conveniently in turning to windward, the aid of a revolving mast would be required—all circumstances which unfitted my new system for general purposes. I therefore allowed the idea to rest awhile, that I might give it more reflection, and I now conceive it applicable to steam vessels, especially those which navigate the Atlantic or open seas, where there can exist no upward or downward eddies of wind, occasioned by the vicinity of high land; not that I would recommend, in the infancy of trials, that they should have longer masts, in order to display a crowd of canvass in moderate breezes; but that in strong winds, whether in sailing with the wind on the beam, quartering, or before the wind, that a powerful neutralized sail should be spread upon their present masts, which should be well supported so as to be able to carry a heavy press, which would give them a propelling power like steam, inasmuch as their bows would not be pressed in the water when scudding, nor would they heel more than was desired in sailing with the wind on the beam. I conceive that if the neutralized system of setting sails were skilfully applied, especially in strong winds, a steam vessel's voyage across the Atlantic might be shortened, and if even by one day, the benefits to the owners would be great; I therefore think the subject is worthy of their consideration.

A sail may be neutralized either by setting it to leeward (in which case it would have the lifting power of a lever, to counteract its effect to heel the vessel) or to windward, when it would have the downward pressure of a lever to produce the same effect, with this difference respecting the position of the sail—that the plane of the windward one requires a lesser angle from the perpendicular than that to leeward; the reason of which, though very capable of explanation, need not here be entered into.

All that I am desirous of at present is, to call attention to the subject, from my belief that it will interest the companies and owners of steam vessels, and that the commanders of them may be induced to embrace the opportunities which will so often present themselves, of trying the system practically, and by so doing eventually conduct it to all the capabilities of which it may be susceptible.

I shall be obliged by your inserting this in your valuable Magazine.

I am, Sir, yours, &c.
MOLYNEUX SHULDHAM,
Lieut. R. N.

Melton Hermitage, near Woodbridge,
September 16th, 1840.

SCREW WHEEL.

Sir,—The screw, as an instrument of propulsion to vessels, has had its numerous advocates and objectors in the pages of your journal, and its properties have been submitted to calculable deduction, more directly in your leading paper of Number 830; also by Mr. Holebrook priorly and latterly. Under such circumstances, therefore, after the able exposition the subject has obtained, and the space which it has occupied in your columns, I am consequently unwilling to intrude myself on your notice, but that the object (if any beneficial result can accrue from its attainment) is important to the public, and should not be abandoned, until every practical means have been resorted to for the elimination of its principles in its fullest capabilities.

Among the conditions for its most favourable application as a propeller, according to the received opinion, the screw should (to act with the greatest economy of effect) consist of parts of threads of a many-threaded screw with its interior parts removed, and its threads should preserve a mediate angle with its revolving shaft of about 45°.

To effect these desiderata, as far as practical adaptation seemed to me to admit, I some time ago devised more than one plan, which I consider to be free from several of the objections urged against the propeller of the *Archimedes*. The disadvantages arising from the "minute gyrations," or tremulous motion produced on the vessel by the unequal distances of the thread of the screw (in its revolution) from the centre of the ship's gyration (adverted to by Mr. Holebrook), is obviated in a screw-wheel which I have contrived and the liability to injury or destruction from shot, when fitted to war vessels, is much lessened by its proportional longitudinal space being shortened; also the resistance is rendered more equable and effective by this arrangement. The wheel occupies, in axle length, only about one-third of the length of its diameter, is strong in its framing, simple of construction, and easy to repair. If the above properties lay sufficient claim to your attention, I beg you will give this brief description insertion in your Magazine; and when opportunity permits, should it prove acceptable, I shall be glad to forward a description in detail, with the necessary drawings for its illustration.

I am, Sir,
Your obedient servant,
J. S. PARTRIDGE.

24, Park-street, Southwark, Sept. 22, 1840.

FALLACY OF THE EXISTING PLANS OF BRIDGE BUILDING—MR. DREDGE'S SYSTEM.

Sir,—From time to time various formulas have been proposed for computing the actions of a bridge, and another has recently been added by Mr. Fordham, any of which will answer for ascertaining the forces to which a bridge of common construction is exposed, or those to which a rope or chain is subject, when suspended in a pendant curve; for, it must be borne in mind, that the common suspension bridge, and a pendant curve, are exposed to the same forces—therefore, one rule has always answered for computing the actions of both, which, unquestionably proves that they have always been considered the same. But the forces to which a bridge upon correct principles is subject are in a different direction to those of a pendant curve; therefore, they are two distinct things; and, although professors may be blind to the fact, yet, I positively assert, and it must be clear to every unprejudiced person who will investigate the subject, that the same theory will not do for computing the results of both.

I will, however, endeavour to explain them, that the professors may have an opportunity of denying my position, if erroneous, and of supporting their own

system if it has the slightest foundation of truth to rest upon; but if they will not turn to the subject, it must remain for non-professors to be judges in the matter.

An equal-sized pendant curve, though apparently supported on two points, is in reality sustained by four, viz.: two, or half the weight on the centre, which multiply directly as the length, and inversely as its depth, and the remainder on the suspension points, with the central forces. Thus, if the depth of a pendant curve be one-twentieth of its length, and its weight be one thousand tons, its two central forces would be five thousand tons, and those at its suspension points 5,500 tons. This shews that a pendant curve should taper, and the spider's web proves it.

It is to this extent, and no further, that Mr. Bennet and other engineers have from the analogy that exists between a pendant curve and a common suspension bridge, tapered the main chains, to compensate for the comparatively inconsiderable reduction of strain at the centre, without even attempting to remove the enormous hold that really exists there, which must obviously reduce the span, increase the cost, and facilitate the destruction.

The Menai Suspension Bridge, which is a stupendous structure, and which reflects great credit on the talent of the engineer, has from the similarity between it and the curve, two destructive central strains; the deflection of the chains is $\frac{1}{15}$th of its length; and if the suspended weight be 1,000 tons, then proceeding in the manner laid down for calculating the forces of a curve, the central strains must be 3,750 tons, and those at the two suspension points 4,250 tons.

Now, a corresponding quantity of iron must be used for supporting these forces, and the trivial reduction in the centre is scarcely worthy of notice; but if those central strains be entirely removed, then, there being nothing to support, nothing is required there to support it; thus then, two-thirds of the material would be saved, and not merely this enormous weight, but also the leverage which is caused by it, would be removed, and the undulation on this structure entirely prevented.

By proper arrangement, the materials in the curve I have described, would construct three bridges of the same dimensions, and each of them would be 4,500 tons stronger. For, the main chains in this case taper from their fulcra to the centre, and are connected to the roadway by a series of inclined rods progressively supporting the flat form to which they are attached, and neither of them suffering any weight that might exist between it and the tower, to pass onward to affect the centre; hence, by this means the central strains are completely removed.

It must be immediately perceived, that the taper here spoken of, differs entirely from that proposed by Mr. Bennet and others, that being merely a compensation for the slight difference of strains between the centre and the base of the pendant curve, whilst a bridge on this principle having no central strain, requires no central power; in fact, the chains are tapered from the size requisite for supporting the whole to that of a single bar or two as may be determined on.

In a letter to Lord Melbourne, which has appeared in your journal, Lord Western, at considerable length, most ably and clearly explained the principle; and Nature's countless forms are direct confirmations of its truth, and that economy of material with principle is power. Indeed how correctly throughout the entire construction of animals do we find their limbs taper from their fulcra; also the wings of birds and their feathers. Again, in the vegetable kingdom, from end to end we find the same grand principle maintained; look at the oak! it is an excellent specimen of the whole; every root to the minutest fibre tapers from its fulcrum; likewise the trunk and every limb, even to the smallest twig that supports only a single leaf, which leaf also gradually and beautifully tapers from base to summit.

I have just been reading an account of the destruction of a suspension bridge at Madras, which broke down whilst a party of soldiers were marching over it. Such has been the fate of several in this country, and can any thing else be expected when it is seen that the whole leverage of the suspended weight accumulates on the centre, and in this instance was increased by the regular step of the soldiery? But when the accumulation of these destructive strains are removed from the centre, then must a suspension be as firm as the firmest compression bridge, more elegant in appearance, and more easy in application.

Beams are subject to the same forces

as common bridges and pendant curves; and iron compression trusses are often used for the prevention of deflection at their centres, which is caused by the accumulation of leverage on that point, but inasmuch as the tension capability of iron is incalculably greater, *then I contend*, that iron *suspension trusses* must be equally superior.

The best mode of arranging materials for increasing the power of beams, bridges, and other bodies, though simple in itself, is in a pecuniary point of view, a branch of mechanics of the greatest value to the public. But as every reduction of cost, must naturally tend to decrease the profits of the engineer, it follows that economy in this department is incompatible with his interest; therefore, it must rest with the public to determine whether they will continue to countenance the old expensive plan, or adopt the system here pointed out.

If the above is worth your notice, its insertion in your journal will oblige,

Sir, your humble servant,

James Dredge.

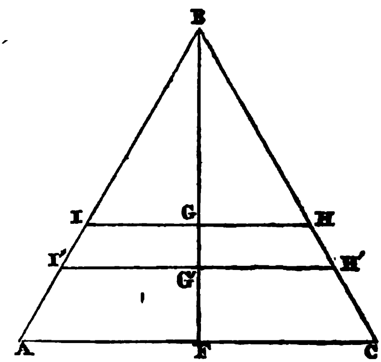
Bath, September 17, 1840.

ON MR. SANKEY'S NOTICE OF A PROPERTY OF THE EQUILATERAL TRIANGLE.

Sir,—I am somewhat surprised that no remarks have been made on Mr. Sankey's method of attempting to *demonstrate* that the three angles of an equilateral triangle are equal to two right angles, independently of Euclid's 12th axiom on the doctrine of parallel lines. (See *Mechanics' Magazine*, No. 872.)

In the first place, I willingly admit that Mr. S. has rigidly demonstrated that if A B C be an equilateral triangle, and you draw B F bisecting the angle A B C, then if B G is made equal to A F, or the half of A C, and I G H drawn perpendicular to B F, " then will B I H be an isosceles triangle, having each of the angles B I H, and B H I equal to two-thirds of a right angle."

The inference that Mr. S. attempts to deduce from the above proposition is, that the three angles of the triangle A B C, are equal to two right angles. He remarks, " Now, from this it might be *somewhat inferred* (this is rather an equivocal expression) that supposing the equilateral triangle to be infinitely small,



as the angles of this equilateral triangle and those of the base of the isosceles triangle would ultimately coincide; therefore, the angles at the base of this equilateral triangle would each be $\frac{2}{3}$ of a right angle, and their sum = to two right angles," &c.

Now, the truth is, the triangle B I H might easily be demonstrated to be exactly $\frac{1}{3}$ of the triangle A B C, and the relation between B G and B F be as 1 to $\sqrt{3}$, and this will always hold true, whether the triangle A B C is infinitely small or infinitely great, or equal to any given space. If we were to suppose the triangle A B C to vanish altogether, or to become = 0, in this case, and in this case only, the $\frac{1}{3}$ part of 0, and 0 itself, become identical expressions. But what have we then got to grapple with? a shadow; a mere mathematical point—a nonentity. In short, the inference that Mr. S. wishes to establish from his general propositions is perfectly inadmissible; it is in fact untrue. But suppose, for the sake of argument, that Mr. S. had truly demonstated that the equilateral triangle A B C, when infinitely small, had its three angles equal to two right angles, what then? Does it follow that this must also be the case in every other equilateral triangle? Certainly not without a demonstration, but Mr. S. at once concludes, without a shadow of proof, that this is the case. In conclusion, it may be safely asserted that Mr. S.'s method of proving that the three angles of an equilateral triangle are equal to two right angles, is a complete failure.

If Mr. S. could prove that if another straight line I′ G′ H′ between I H and A C be drawn perpendicular to B F, and that each of the angles B I′ H′, B H′ I′, is ⅓ of two right angles, and that this is always true in every similar position of the flowing line I′ G′ H′, between I H and A C, (A B C being any equilateral triangle whatever,) then the truth of the proposition would be established; but to do so, would (I am afraid) require a knowledge of the 29th and 1st of Euclid, and consequently an admission of the truth of the 12th axiom, though these are the very things that Mr. S. wishes to avoid.

I am, Sir, &c.

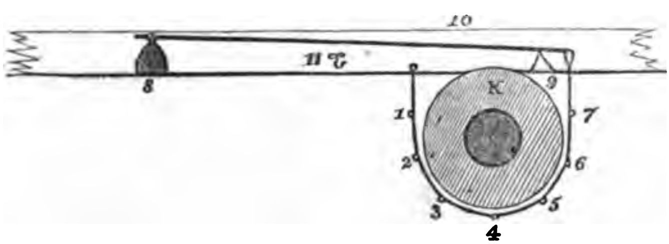
KINCLAVEN.

September 4, 1840.

P.S.—Mr. S. remarks in the new proof he has given (No. 880,) of the 5th proposition of the 5th book of Euclid, "That the demonstration of *Playfair*, viz., 'that there is nothing in the conditions of the proposition, why one angle should be *larger* than *another*, therefore they must be equal,' though perfectly true as based upon the theory of *functions* (!) cannot be considered satisfactory in a geometrical point of view." I do not know what Mr. S.'s definition of a function may be, but I am sure it has no more connection with the generally received definition of a *function* than it has to do with *Magna Charta*. The theory or principle upon which *Playfair* founds the above method of demonstrating the 5th proposition (in his notes let it be observed) is nothing else than the "principle so celebrated in the philosophy of *Leibnitz*, under the name of the *sufficient* reason." The demonstration given by Playfair in the text has nothing to do with this principle; it is nearly the same as that given by Dr. Simson, or that given by Euclid himself more than two thousand years ago.

A.

CARRIAGE WHEEL RETARDER.



Sir,—In your No. 875, of May 16th last, reference is made to a coach wheel retarder invented by R. W. Jearrad, jun., Esq. I was somewhat surprized on reading the note, as it is spoken of as a modern invention, when such, I believe, is not the case, it having been commonly used, or at least the principle, by the carters, &c., landing flags from Worsthorne Guarne to Mr. Richard Chiffen's stone wharf, at Burnley. The sketch accompanying this is the plan adopted by the carters. I shall be glad to know whether Mr. Jearrad's is the same, if not, in what respect it differs.

I am, Sir, yours, &c.

RIVER CALDER.

Burnley, 10th June, 1840.

Description of Engraving.

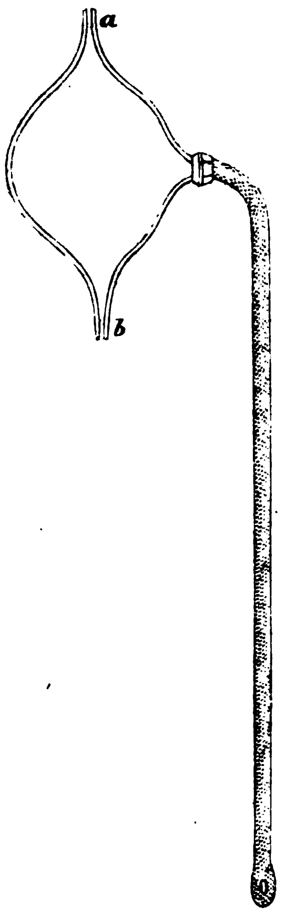
Nos. 1 to 7 are joints in what carters term the break, hanging round the knave of the wheel K.

8 Is a weight on the lever.

9 The fulcrum on (10) the bottom frame of the cart.

When out of use the break is detached from the end of the lever, and hung upon a hook at 11.

[DESCRIPTION OF A CHEAP AND POWERFUL STOMACH PUMP. BY JOSEPH MACSWEENY, ESQ., M. D.



Sir,—In a former number of the *Mechanics' Magazine,* I described an apparatus for restoring *suspended animation.* I now send a sketch (which I hope will be acceptable) of a cheap and efficient stomach pump which I had made in Cork some years ago, and which has been found to answer well.

Whatever is cheap and simple, will be generally adopted. The chances of saving lives increase as the means of affording relief are multiplied. Some person in London might find it his interest to make pumps of this kind for sale.

The pump consists of a glass bulb, having a tube *a* at the upper part, and another *b* at the bottom. From the side a short tube is given off, to which a collar is cemented, and the gum-elastic tube is screwed on to it. When the elastic tube is introduced into the stomach. the operator closes the orifice of the lower tube *b*, with his thumb; while he applies his mouth to the upper one *a*, to cause an exhaustion. The liquid ascends from the stomach up into the bulb, and escapes by the orifice *b*, when the thumb is removed. The process is to be repeated, until all the liquid is removed.

For washing out the stomach, a vessel containing water is placed under the lower tube, while the gum-elastic one is in the stomach.

The operator causes an exhaustion as before, and the water rises into the bulb; he now holds the bulb, so that the water will descend by its gravity into the stomach.

As all stop-cocks and valves are dispensed with, this pump is not liable to get out of order; and thin gruel may be introduced into the stomach, to envelope the particles of arsenic, &c., and may be drawn up again.

I had a pump made with the end of the upper tube bent horizontally, a form which enables the operator to apply his mouth conveniently; but the horizontal end takes up more room, and lightness and simplicity are advantages in a portable article. I prefer the plain vertical tube.

Any person who will make the experiment of raising mercury in a tube by the power of exhaustion with the mouth, will perceive that this pump is a very powerful one. All jolting is avoided in the working of it; in working the piston of the ordinary stomach pump, some inconvenience is experienced by a patient.

It is evident that the pump can be be made of other materials as well as of glass. The orifice of the upper tube should be small, that the mouth of the operator may be able to command the exhaustion.

I remain, your obedient,

JOSEPH MACSWEENY, M. D.,

Cork, August 20, 1849.

ON THE USE OF THE SLIDE RULE.

Sir,—As the nine digits on all slide rules are arbitrary numbers, "and may represent units, tens, hundreds, or thousands of units, &c., or may stand for a tenth, hundredth, thousandth, or ten thousandth part of unity," there may be no small difficulty in determining the true number or value of places assignable to them, when answering questions by these instruments, especially if they be such as seldom occur in the ordinary course of business. An excise officer, when gauging a cask, or a carpenter, in measuring a piece of timber will tell you, that one contains so many gallons, and the other so many cubic feet; but if you ask either of them why the contents are neither more nor less than what he has stated them to be, he can give you no definite answer, only—that it is, what he says it is. And as such a reply is what no scientific man would admit to be satisfactory, it is greatly to be wished that some of your correspondents would lay down rules, how the exciseman might at once positively determine the true contents of any vessel he has to gauge, although not larger than an egg, or if more capacious than the great tun at Heidelberg; and would tell the carpenter, how to know by his slide, the just measure of a tree, disproportioned as it may be to any thing he has ever met with in his practice. This would be to confer an obligation on both; as they would then have that to guide them, on which they might rely, instead of being dependent on so vague a thing as—*guess*.

I know of no recent author, who has given the most distant insight into this desideratum; nor any old one, except the Rev. W. Flower, who published a "Key to the Modern Sliding Rule," in 1806, a work which has long since been out of print. His method of determining the true answer, is, by "imaginary and collateral radii, and other abstruse rules, which but few can comprehend.

If any of your correspondents (and there are those whose names stand on your pages, who, I presume, are able,) would elucidate this hitherto dark subject, instrumental calculations would be more frequently adopted; but if they remain silent, the thing will be deemed impracticable, and sliding rules esteemed only as auxiliary calculators.

Should the object I have presumed to call the attention of yours readers to, not be deemed of sufficient importance to merit their notice, I shall, perhaps, be induced at some future period, to humbly attempt doing something towards removing all doubt from the mind of a tyro, when seeking on his rule, an answer to a question.

Yours,

GILBERT YOUNG.

Spalding, Lincolnshire.

THE "ECLIPSE" STEAMER.

Sir,—In noticing the communication of "Candidus," in your last number, let me premise that I am neither "Mr. Napier himself," nor "some one in his employ," nor am I in any way more connected with him than your correspondent. The same motive which induced "Candidus" to take "a trip to Margate," influenced me, viz. a desire to judge for myself of the truth of the reports which were in circulation respecting the speed of the *Eclipse*. The result of my investigation was published in your 890th Number, and is now in part confirmed by "Candidus." But whatever might have been the object of "Candidus," in going on board the *Eclipse*, it would seem as if his intent in addressing you, was not so much to elicit truth as to *run down* the character and capability of the boat: a species of conduct to which too many steam-boat proprietors on the river are addicted, and which has been adopted towards other boats and other parties than Mr. Napier.

"Candidus" asks if I will "say at what pressure she (the *Eclipse*) is worked?" To this I answer that I should have done so in my last communication if I had been acquainted with it; but the fact is that *I did not know it*, and had no wish to make assertions which might be erroneous. I had heard that the *Eclipse* had been advertised to run against any boat afloat with less pressure than her opponent, and I was consequently quite as anxious as "Candidus" to know the exact pressure at which she actually worked; but here I experienced the same difficulty which your correspondent complains of, though I saw no such being as "the modern Cerberus" guarding the engine-room doors! My own *impression* is that the *Eclipse* is worked with steam at a pressure of 8 or 9lbs. in the boiler; but I have only formed this opinion from comparing the *colour* of her steam (if I may be allowed to use a misnomer), as it issued from the waste pipe, with that of other boats when blowing off. This I

admit is a sort of guess-work which cannot be much relied upon; but as it affords the only means I possess for replying to your correspondent's question, I am obliged to use it. With the next portion of the epistle of "Candidus" I have nothing to do; nor, if I had, do I conceive that it would at all interest your readers to know whether "the owners" were losing or gaining two or three hundred pounds per week. But "Candidus" says, my assertion that the *Eclipse* has "less vibration than any boat I was ever in" "disparages my whole communication." He does not, however, condescend to tell us *why* it does so, unless indeed we are to understand that the word "vibration" and "the shooting motion of the *Eclipse*," which he mentions, are synonymous terms. If this be his meaning, I would recommend him to consult his dictionary, where he will find that *to vibrate* is "to quiver," or "to play with a tremulous motion," and it is in this sense only that the word is ever applied to the motion of steam-boats, which is very different to the "shooting" of the *Eclipse*, and much more disagreeable too, although I agree with "Candidus" that the *latter* is "exceedingly unpleasant." It is, however, common to all boats with *one* engine, and is caused by the greater rapidity with which the wheels travel, after the engine has passed her centres—and, I may add, bears a strong resemblance to the motion of a sculler through the water.

"Candidus" has concluded his communication by a *supposition* that the new iron boat *Father Thames* is "quite a match for the *Eclipse*." In order to give your readers an opportunity of testing the correctness of this side-wind assertion, I will inform them that I went, a day or two ago, with some friends, on board the former boat, to Gravesend. We passed under London Bridge at 23 minutes past 10, went by Greenwich Hospital at 43 minutes past 10, and arrived at Gravesend at 5 minutes past 12; having been 1 hour and 42 minutes in steaming the 28 miles, or at the rate of 16½ miles per hour, the tide running in our favour about three miles per hour. It is proper to add, that the *Father Thames* had *six stoppages* on its passage, and had 300 persons on board. Having been assured by "Candidus" that all was "fair and above board" on the *Father Thames*, "and *open to inspection*," I of course concluded that, as I had "paid for peeping," I should be allowed to pay a visit to the engine-room. But here I was met by a request to read the "*No Admittance*" written in chalk on the side of the hatchway. I confess that I was not sufficiently impertinent to say that I "*would* have a look," and therefore walked away at once.

For this reason I am unable to give you many particulars of *Father Thames*. The boat is, however, 150 feet long, and 19 feet beam, and is propelled by a pair of Penn's oscillating engines, with cylinders 35 inches diameter, and 36½ inches stroke, making (while I was on board) 30 strokes per minute. Her paddle wheels are about 18½ feet diameter, and 8½ feet wide; and the pressure of steam in the boilers, which are of the description known as *Spiller's patent*, is about 8lbs. on the inch.

If "Candidus" knows as much of "the fastest packet in the world" as he assumes to do, he will perhaps inform your readers "how her speed is attained;" and at the same time state whether the rattling of the funnel, and the shaking of the cabin tables in the *Father Thames* is caused by "*vibration*."

I am, Sir, your most obedient servant,

A SUBSCRIBER.

Poplar, Sept. 23, 1840.

HALL'S SYSTEM OF CONDENSATION.

Sir,—Agreeably to my promise, I again address you, and shall continue in discussing mechanical and scientific subjects to divest them as much as possible of all personal matters and private interests. I perceive that subsequently to the publication of Mr. Hall's letter in your 884th Number, and of Mr. Oldham's in your 886th Number, several of the writers in your work require further explanation; it will, therefore, be the object of this letter to discuss the several points at issue. The first matter upon which I shall touch, is the relative time or rapidity of the process of condensation by Mr. Hall's condensers and the common condensers.

On this subject, "A Looker on," in his letter of August 3, quotes "Scalpel's" following words—"In both my papers I have dwelt upon the *time* taken in connection with the vacuum as the criterion of power—it is the very essence of discussion, but, hitherto, carefully avoided." "A Looker On" then proceeds thus—"Mr. Hawke, and after him Mr. Oldham, write in answer, but do not give any explanation of this the most material point in the controversy; surely Mr. Oldham *must* be aware that his paper in your last number left the matter just where it was, and that though the vacuum in the upper chamber is shown for any required length of time," as he observes, yet that "until he informs us at what part of the stroke the vacuum of 30½ inches does take place there, the fact is inconclusive." Pray, Mr. Editor, can you tell me (for I have tried in vain to make it out) what "Scalpel" means by asking, at what part of the stroke the vacuum of 30½ inches takes place, and what "A Looker on" understands by quoting

and thereby repeating that question? Can any thing possibly be more clear than that Mr. Oldham must mean that such a vacuum exists at all times, and during the whole or every part of the stroke, or any number of strokes, varying or undulating a mere trifle, or *standing steadily?* If he do not mean that, he can mean nothing, and I must say that this appears so clear to me that I should not have thought it possible to put any other construction upon Mr. Oldham's statement. As "V. I. E." asks the same question of Mr. Hawke as well as of Mr. Oldham, I refer him to this answer. The above also appears to me to be all that I have to say to "A Looker On," unless I were to repeat arguments already adduced by private writers over and over again, but which seem to have been lost upon him. With respect to "V. I. E.," he appears to be quite puzzled with what Mr. Hawke says at page 136, viz. "I agree with 'Scalpel' that the barometer is not a conclusive test of the power exerted by the engine, but it is conclusive so far as the action of the engines depends upon the state of the vacuum in the condenser." "V. I. E." then continues his quotation from "Scalpel," as follows—"a little consideration, and Mr. Hawke will not agree with himself or Mr. Oldham." Now I see no inconsistency in Mr. Hawke's statement, but a judicious discrimination respecting the effect produced by a vacuum independently of other circumstances which may interfere with, and vary its *practical* efficiency, such as the size and construction of the steam valves, steam pipes, &c. These things have nothing to do with the vacuum, and they may vary so as to retard, more or less, the free passage of the steam from the cylinder to the condenser, and consequently reduce, in various proportions, the relative perfection of the vacuum in the cylinder compared with that in the condenser. Thus, for instance, there may be a vacuum in a condenser of 30 inches, which, by judicious and sufficiently capacious valves and pipes, may give an average vacuum of 29 inches in the cylinder; but other valves and pipes of less dimensions and of less judicious construction may, with the very same vacuum in the condenser, so wire-draw the steam (to use a technical phrase) as to cause the vacuum in the cylinder to be very considerably less, perhaps not more than 26 inches. I contend, therefore, (and it is evident that Mr. Hawke means the same thing,) that there are two causes of the amount of vacuum in the cylinder perfectly distinct from and independent of each other, viz.: first, the amount of vacuum obtained in the condenser (no matter whether it is in Mr. Hall's or in the common condenser), and, secondly, the degree of facility with which the steam is passed from the cylinder to the condenser, whether (as above mentioned) from the size and arrangement of the valves and steam pipes being more or less capacious and judicious or from any other cause. A bad vacuum in the condenser, with a good and free passage of the steam, may produce as good or even a better vacuum in the cylinder, than a very superior vacuum in the former would produce in the latter, if the steam be considerably wire-drawn in its passage from the one to the other. But will any one for a moment contend that a good vacuum in the condenser will not (all things being the same) produce one in the cylinder superior to what a bad vacuum in the condenser will produce in such cylinder, and that in proportion to the difference between the two vacua in the condenser? If Mr. Hawke and I are correct in the above view of the subject, will any one again repeat the *cuckoo* note of the vacuum? I am ashamed of adopting this minute, and I admit tedious style of explaining myself, but when I read what has been written by Mr. Oldham on this subject in your 886th Number, and find that it is not understood, I know of no other style adapted to the understandings, of those who do not comprehend that gentleman's clear statement, which runs thus:—"But Mr. Hawke has done it in so beautiful and lucid a manner, that I need not add another word upon the subject; I will, notwithstanding, follow in his wake, and tell Mr. Armstrong, without fear of contradiction, that if with a vacuum in the top chamber of Mr. Hall's condensers of 30½ inches, there be only an average vacuum of 25 inches in the cylinders, the result would be that if the vacuum were less by three inches in the condensers, or only 27½ inches, in the same proportion would it be reduced in the cylinders, viz. from 25 inches to 22 in." I will now proceed to notice a most extraordinary statement of "R. S. M." about the undulation of the mercury in the vacuum gauge; he says, "Why this very indulation is the best proof he could bring forward of the suddenness of the vacuum, if we are to understand that in both cases the gauge is the same, &c." Now, I really think this is a *bull*, and that instead of his requesting of you to be allowed one bull, he should have stipulated for this second bull with several others that I could point out, which make me suspect that he is incorrect when he says that he is *not entirely ignorant of the subject*, for, let me ask, what the undulation of the column is owing to? "R. S. M." himself says, "the vacuum is renewed and destroyed about 60 times in a minute;" will that writer pardon me for suggesting that he should have said *partially* destroyed, &c.? He surely does not mean to say that it is *wholly* destroyed and *wholly* re-

newed 60 times in a minute, for if that were the case, the mercury in the vacuum gauge, instead of undulating in the common condenser three, four, or more inches would undulate the whole of the column of mercury produced by the vacuum, whether it be 27 or 28 inches, or any other height. It would be quite amusing to see such an undulation of the mercury. If "R. S. M." concede to me my additional word of *partially*, then I will tell him, that according as this *partial* destruction is greater or less, will the undulation of the mercury be in the same ratio, greater or less, and that consequently a greater destruction of vacuum takes place, and has to be restored so many times per minute in the common condensers, where the undulation is great, than in Hall's condensers, where it is very little.

"R. S. M." asks, at page 235, as follows: "does Mr. Hall or Mr. Peterson really wish the public to believe that the vacuum in his condenser is equal to between 29½ and 30½ inches?" "I defy Mr. Hall or any other person to prove that a vacuum of 30 inches has ever been obtained by means of his, or any other condenser;" and at the same page he observes as follows:—"A gauge attached to the condenser of a steam engine standing *steadily* is something new, and to most of your readers must be rather incredible, especially when they consider that the vacuum is renewed and destroyed about 60 times in a minute. If it really does stand *steadily*, which however I do not believe, it is a *sure proof* that the vacuum is formed *very slowly*." In answer to these questions and observations, I beg to refer him to my explanation in your last Number, of the nature of Bedwell's vacuum gauge, and to the testimonial of Captain Roberts, &c., in your 873d Number. I confess, that notwithstanding the extraordinary vacuum there testified, I should give credit to it on the evidence of such persons, had I no other proof; but fortunately I have another evidence, namely, that of my own eyes; and I assert, in spite of "R. S. M.'s" defiance, that I have seen the engines of the *British Queen* at 30½ inches, or within half an inch of a Torricellian vacuum, this being (as I have explained in my former letter) independent of the state of the atmosphere. This amount of vacuum is certainly surprising, and unheard of in injection engines; but it is nevertheless true, that it is to be found in engines with Hall's condensers. "R. S. M." calls Mr. Peterson, Mr. Hall's *manager*. Of course Captain Roberts, Messrs. John Johnson, Alex. Mentissly, D. Mentissly, W. Stirling, and Arch. Weir, are all Mr. Hall's managers, as they have all, as well as Mr. Peterson, testified to having seen the vacuum on board the *British Queen* at 30½ inches, by Bedwell's barometer. I should have avoided using names but could not reply to some parts of "R. S. M.'s" letter without doing so. If, after all that has been said, "R. S. M." still think the vacuum produced by Hall's condensers is an unsettled question, and that such men as Captain Roberts, Mr. Peterson, &c., are not to be believed, I am of opinion that he will not find the public so sceptical, especially as many other persons besides those belonging to the vessel, have seen the column of mercury at the heights mentioned in the log of the *British Queen*. In your 873rd Number, "R. S. M." further states, as follows—"but perhaps the perfection (of the vacuum) owes a *little* to the patent barometer which Mr. Hall finds to answer his purpose so well, that when he asks an engineer to certify as to the height of the mercury, he refuses to allow the common or long barometer to be used. I know this to be the fact in one case at least." Now, I think "R. S. M." should have mentioned the *one* case, and I hope he will be so candid as to do so, because though I cannot speak generally of Mr. Hall's proceedings, I, also, like "R. S. M.," can speak of *one case* in which he recommended the application of both Bedwell's and the common gauge to the condenser, and that *one case* was in Her Majesty's steamer the *Megara*, and the engineers who made her engines, as well as many other gentlemen concurred, can supply "R. S. M." with the result.

I shall, in my next letter (as this is already sufficiently long), proceed with the discussion of other scientific matters (and I may even say errors) contained in the letters of "R. S. M." in your 889th Number, and of "Scalpel," in your 890th Number, some of these I consider to be of an exceedingly interesting nature, particularly the essential difference between Mr. Hall's system of condensation and the system of Mr. Howard and Mr. Symnington; I say system, for I shall show the plans of the two latter gentlemen to be in principle identically the same.

I remain, Sir,
Your very obedient servant,
HONESTOMETER.

September 19, 1840.

ON THE SUPPOSED INFLUENCE WHICH THE ROUGHNESS AND POLISH OF SURFACES EXERT OVER THE EMISSIVE POWER OF BODIES. BY M. MELLONI.

When we subject to measurement, the heat which radiates from a metallic vessel filled with boiling water, one of whose longitudinal sides remains well polished and brilliant, and the other roughened by emery, by the graver or the file, we find the quantity of heat thrown off by the depolished surface to be always superior to that which issues from

the brilliant side; the difference sometimes exceeding the proportion of two to one. It is hence inferred that the observed increase of heat is occasioned by the superficial inequalities produced on the roughened side, and consequently that asperities on the surface of bodies, tend to facilitate the emission of their internal heat. I am about to communicate to the Academy a sketch of some researches, which, as it appears to me, plainly show that this supposition is entirely erroneous, and that if the superficial layers evidently contribute to vary the quantity of heat emitted by a hot body, the condition of the surface has no part in the production of the phenomenon.

I may acknowledge that, from the beginning, notwithstanding the authority of great names, the influence of polish in the radiation of caloric, always appeared to me very doubtful. It was said that internal heat experiences the same superficial obstruction in leaving the polished surface as radiant heat does in penetrating it from without. Be it so; but why should those little shining facets, which are produced by scratching, reflect less heat internally, than the polished surface of a single piece? Take a receiver of brass, having two polished sides slightly tarnished by exposure to the air. On one of these sides make a series of parallel furrows, by the graver; the sides of these will certainly be more brilliant than the rest of the receiver, and yet the furrowed surface will emit more heat than the smooth surface. About two years ago I mentioned this objection, and that of some other analogous experiments, to Messrs. Bache, Henry and Locke, distinguished professors of philosophy from the United States of America, then at Paris. At the present time, as the question appears to me to be decided, I shall pass over indirect objections and proceed to the immediate results which lead to the proof of what I am advancing.

I took a cubical vessel of copper whose four faces were well prepared, and soldered upon the angles and edges at the bottom, small spring slides, in such a manner as to press tightly against the sides of the cube plates, two or three lines thick. Then having procured two pair of plates, one of jet and the other of ivory, I applied them to the four sides. Each pair was composed of plates perfectly equal in all respects except in the condition of the external surface, one of which was smooth and brilliant, and the other unpolished and scratched with emery. Measuring with exactness by the thermo-multiplier, the quantities of heat emitted by the two polished faces when the receiver was filled with hot water, and comparing them with that which issued from the corresponding roughened surfaces, I found a difference of only one to two hundredths, and that sometimes on one side and sometimes on the other: the mean of twenty trials gave a variation of scarcely a few thousands, and which of course was unworthy of notice.

It may be objected that in this experiment we are not certain that the two similar plates, notwithstanding the care taken to maintain their contact with the vessel, were of equal temperatures. To obviate this objection, I had a little block of marble formed into a cubical vessel, the sides of which were reduced to an exactly equal thickness. One of the external surfaces was left smooth and polished. The second likewise smooth, but tarnished and depolished, the third furrowed in one direction, and the fourth cross furrowed perpendicularly. The vessel when filled with hot water, threw off from the four sides equal quantities of heat.

It appears, therefore, that a more or less irregular condition of the surface has no influence on the emissive power, when the radiating body is not metallic.

I covered with lamp black, one of the faces of my marble vessel, as well as one of the plates of each pair in the previous experiment. Calling the emissive power of lamp black 100, I could easily determine by proportional numbers the emissive powers of ivory, jet and marble: all three were comprehended between 93 and 98. May it not be alleged that if in these substances the influence of depolishing amounts to nothing, it is because their emissive power was near the maximum beyond which an increase was not to be effected, the emissive surface being unable to prevent the issue of its heat; while in the metals, very far from this limit, an alteration in the condition of the surface must necessarily exert all its influence, and become sensible by the great difference in the heat emitted.

Though this reasoning is founded on a pure hypothesis, namely, that lamp black opposes no resistance to surface radiation, and that the emissive power of the three substances may be, on the one hand, far enough from 100 to allow us to appreciate the variation produced, and on the other so energetic that the least proportion of a change occurring in their values would cause them to overleap the whole distance which separates them from this number; nevertheless we will abandon for a moment non-metallic substances, and try to resolve the question by the bodies themselves, with which we first set out.

Copper, zinc, pewter, and tinned iron, which as far as I know, are the only metals that have been employed thus far in experiments on this subject, when exposed to the air, are speedily coated with a slight invisible oxide, but whose presence is manifest from certain electric phenomena. Now we know that the emissive power is much stronger in oxides than in metal. It may happen then that the

scratched surface, presenting to the air a greater number of points of contact, becomes more abundantly oxidated than the polished surface, and thus has its radiating power increased by the simple fact of oxidation, independently of the greater or less regularity of its superficial points having anything to do in the matter.

To ascertain whether this view of the case is supportable, we have only to operate with gold and platina. To this trial I had recourse; but the abraded surfaces of platina and gold gave me a calorific emission much more abundant than the polished plates of both these metals.

Oxidation, as well as the influence of polish in non-metallic bodies, being then excluded, what is the peculiar alteration in metals which may accompany in these bodies, the change, more or less extensive, to which their outward coat or layer is subjected? This can be no other, in my opinion, than a change of hardness or density. In fact, jet, ivory, and marble are substances in which compressibility is almost completely absent, or at least they do not possess, in any sensible degree, the property of retaining, in a stable manner, the modifications of density and hardness which a mechanic force may chance to impress upon them. They are fashioned into plates without the aid of pressure. Metals, on the contrary, are compressible, and the common sheets so well known in commerce, are, as is well known, produced by the powerful pressure of the hammer or the rolling press. These sheets, as well as wire, are well known to possess greater specific gravity and hardness than cast metal. How do we know that this greater hardness and density are uniformly distributed throughout all points of the mass? Is it not more probable that during the operation of rolling, the surface undergoes a pressure and condensation greater than any other part, and that the resulting sheet is definitively enveloped with a kind of crust of superior density and hardness to the internal layers? This admitted, it is clear that in scratching the surface we open into portions of less density or hardness. Now in glancing at the tables, which present the radiating power of bodies, we perceive that these powers follow, in general, the inverse ratio of densities. Admitting from analogy that the same law takes place in the various states of condensation of the same substance, we must infer that by making furrows in the surface of a plate we ought to obtain an increase of radiating power. Add to this, that the parts which compose the superficial coating being disengaged by the subdivision of their mutual contact, must be loosened, and thus acquire by a diminution of density an emissive power which approaches to that of the more tender layers within.

It follows from this view—1st, that a polished plate of metal radiates a quantity of caloric increasing in proportion to the diminution of the density or hardness of its layers; 2nd, that in cases of the least density or hardness the increase of the radiating faculty, produced by taking off the polish, will be inferior to that obtained by thus treating plates of greater density or more thoroughly encrusted.

It is almost unnecessary to add that in verifying these theoretic views we must not employ an oxidable metal at an elevated temperature, for a plate of this kind of metal has a tendency to increase its emissive power, which varies from one moment to another with the condition of its superficial coating, and the more as these coats become more tender and more divided.

Strong percussion, and a slow passage from the fluid to the solid state, are the two means by which we may vary the density of metallic bodies. I had two plates of very pure silver made by strong hammering, and two others by melting and slow cooling in their moulds of sand. With these I formed a hollow rectangular prism to which I gave a metallic bottom. They were united by soft solder so as not to alter their densities or temper during the operation. The four lateral faces were perfectly polished by pumice stone, or charcoal, without the aid of the hammer or burnisher. One of the melted and one of the forged plates were then well rubbed in one direction with paper coated with coarse emery; the images of objects which appeared very clear and distinct on the polished plates were completely effaced by the rubbing, which rendered them dull and streaked. The silver vase, thus prepared, was filled with hot water. The four lateral faces turned successively to the opening of my thermo-electric instrument produced on the galvanometer the following deviations:

10° on the forged polished plate.
18° on the forged roughened plate.
13.7° on the cast polished plate.
11.3° on the cast roughened plate.

In comparing these four results, we find, 1st, that in the polished plates, the cast metal gives about a third more heat than the forged, which demonstrates the influence announced in the case of minor density; 2nd, that the effect of roughening, on the two kinds of plates, differs not only in intensity, as was predicted, but in sense (*sens;*) for if the radiating power of the forged silver receives an augmentation of four-fifths by the action of emery, that of the melted silver undergoes, on the contrary, a *loss* of almost a third.

This unexpected fact, which proves in an irrefragable manner the truth of our fundamental proposition, is perfectly explicable on

the theory which we have just before developed, for the pressure of a hard body like emery on the tender surface of the melted silver, compresses and condenses to some extent the rubbed particles, and renders the bottom of the furrows on one of the plates harder than the entire surface of the corresponding plates.

I regret having been unable to operate in the same manner on vessels of gold and platina, in which these manifestations, in all probability, would have been exhibited on a more extensive scale, on account of the great difference of density producible on these two metals by fusion and percussion.

In referring to the early observations of Leslie, we see that the several metallic plates that he employed gave him constantly a greater emissive power when rough and irregular than when smooth and polished. Nothing appeared more natural after this than to admit, in the phenomena of calorific emission, independent of the influence arising from the quality of the superficial layers, a special influence due to their degree of polish, at least with respect to the metals, and these were the conclusions derived from the facts observed by Leslie,—and, nevertheless, this conclusion, apparently so simple and direct in appearance, was considered inadmissible.

This example may serve, on occasion, to moderate the luckless facility with which certain experimenters hasten to put forth in the form of general laws, the consequences resulting from their early observations. It too often suffices, by taking an instrument in hand and employing it in some particular research, to fall upon a new fact; but in pursuing the labour with assiduity, in varying the method of experimenting; analyzing the phenomena under different aspects, it almost always happens that the labour ends in the perception that the novelty was only in appearance, and that the true explanation falls under the truths already classed in science; or, if a new truth finally results from the labour, it is almost always contrary to those pretended general laws which first presented themselves to our minds in a manner so attractive and decisive.—*Translated by Professor Griscom, for the Journal of the Franklin Institute.*

REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS APPOINTED 7TH FEB. 1840, TO ENQUIRE INTO THE EXPEDIENCY OF EXTENDING COPYRIGHT OF DESIGNS.

Report.

The Select Committee appointed to enquire into the expediency of extending Copyright of Designs, and to whom several petitions were referred, and who were empowered to report their opinion together with the minutes of evidence taken before them, have come to the following resolution, which they have agreed to report together with the minutes of evidence taken before them.

Resolved—That it is the opinion of this Committee, that it is expedient to extend Copyright of Designs.

6th July, 1840.

[From the following extract from the minutes of the Committee it will be seen that the resolution in favour of extending copyright of designs was carried only by the casting vote of the chairman.]

(Mr. Emmerson Tennent in the chair.)

" Motion made and question proposed—

" 'That in the opinion of this Committee it is expedient to extend copyright of designs.'

" Amendment proposed—

" 'To leave out all the words from the first word "that," in order to insert the words "The Committee do report the evidence to the House." '—(*Mr. Ewart.*)

" Question put, that the words proposed to be left out stand part of the question."

" The Committee divided—

Ayes 6.	Noes 6.
Mr. Mackinnon.	Mr. Mark Phillips.
Oswald.	W. Williams.
G. W. Wood.	Baines.
Godson.	Sheil.
Grimsditch.	Ewart.
Hutton.	Stansfield.

" The Chairman voted in the affirmative.

" So it was resolved in the affirmative."

Minutes of Evidence.

(Abstract.)

Mr. John Brooks, called in, and examined:—Has been long engaged in the printing trade of calicoes at Manchester; sees no reason for an alteration of the Copyright Act, which has not existed at former periods during the 30 years he has been engaged in the trade. The present Act has been carried into effect without much difficulty; believes there has only been one trial upon the subject in the whole 50 years; is in a very considerable line of business as calico printer, printing about 6000 pieces a week. Is the largest printer in the kingdom of his own cloth. Has one pattern drawer in London, to whom he pays a salary for drawing patterns. Has two that do nothing but draw patterns, and six others that sketch and put on patterns; in all, has nine in his drawing shop. Does not purchase patterns from persons that carry on the trade of pattern drawing; did in one instance buy a pattern, about two years ago, but makes a point of not buying any at all, and was merely per-

suaded to buy that pattern because some of his salesmen said it was an excellent pattern; it was a furniture pattern. The trade of pattern drawing is a very extensive trade, and many persons are employed in it in Manchester. Witness formerly bought patterns, but since he has done so much business, and employed so many drawers, has not done so; there are many designers that regularly go about selling their patterns. Employing so many persons in designing as he does, it might be his interest to maintain as efficient a copyright as is possible to be established; but does not mind parties copying, because it exalts his name with the public to say that he has originated new things. He once offered James Thompson, of the firm Chippendale and Thompson 100*l.* if he would copy one of witness's patterns. His reason was this; James Thompson is one of the first printers in the town of Manchester, bringing out originals, copies of French patterns, imitations, and so on; and if he had copied his he would have given each of his travellers one of those patterns, with the publication as the Act directs upon it, and they would have shown their customers those patterns, and by that means they would have thought witness's firm were first-rate printers, when such people as Chippendale and Thompson copied them. He was not apprehensive that Chippendale and Thompson could produce better work, or cheaper work than they were able to do, and therefore was not apprehensive of a competition; but would rather they should have copied than not, because it exalts their name, and they thrive better under people copying them than otherwise. "Our people are all at full work in ideas, and they say if we bring out an original pattern we never bring one out but we can bring another." Witness never knew but two original patterns in 30 years; they are all designs taken from other patterns put together. Witness has a drawer in London who is here now. His business is to go from the city to the west-end to look through the windows and to imitate patterns, to take a little bit from one and from another, and to make it into a pattern; and then witness, as a calico printer, will say it is a new pattern—although all the objects of it are taken from other patterns. They are old patterns, but have certain styles in them, and he can frequently turn his patterns into another man's style. Would publish a pattern so obtained as an original design belonging to himself. It is the custom of the trade to call a pattern an original design when all the objects of it have been obtained from other persons' patterns. Would himself put it down as an original pattern, and should mark it at the end of the piece, and if anybody copied it, and he was disposed, he could get an injunction against them. With regard to extending the present copyright of three months to twelve months, or even six months, thinks it is bad already, and it would be much worse if it went further. Is of opinion, as one of the largest and most experienced calico printers in Manchester, who has been engaged in the trade 30 years, that even the present law is injurious to the trade. And is perfectly satisfied that if the term of copyright were extended, the injury would be increased. Should say that it would be beneficial to those that apply for it; it would be more so to him than any one of them, as an individual, because he is more interested in that principle prevailing, provided it were for the interest of the country altogether; but contends that they are wrong in principle. From employing so large a number of new pattern drawers, it would be more to his interest to maintain a valid copyright in patterns than that of any calico printer in Europe. Is of opinion that even the present protection is injurious to the interests of the trade, because it is tyrannical in its operation. If the period of copyright were extended thinks the number of injunctions moved for would be increased, should say fiftyfold at least; perhaps more than that, because there are very few at present in consequence of their writing letters to get them stopped; but they would allow a man to get his print out and sell it for a fortnight or three weeks, and then get 20 injunctions at once and ruin the man. The reason that under a three months' copyright injunction cases have not been more numerous is because at present the term being three months, if they threaten to get an injunction against him the man will stay his patterns and will not sell them at all: and if the other party says, "You have sold so many at such a price," he will submit to pay the loss to the gentleman who professes to have the original pattern, rather than suffer himself to have an injunction against him. Should think that on an average he has published from 400 or 500 to 600 original designs per annum, having secured the originality of these patterns to himself. If any other parties were to create fresh designs by combining those patterns together, considers that his right to them would pass away and that they would become theirs; at any rate they would call them theirs. And they might move for an injunction against witness if he combined his own original patterns in the same order in which they had done. They would say they were their patterns. Supposing that any printer in the town had chosen to catch the popular feeling, and had printed upon a cotton fabric the head of Her Majesty and Prince Albert as a design, and he had chosen to produce Prince Albert and Her Majesty

as a design upon another fabric, that would have been considered an invasion of an original pattern. (?) Supposing he had brought out a design with the head of Her Majesty the Queen Dowager, and that recently he had published a new design with her present Majesty and Prince Albert together, and that then somebody else chose to combine the whole three, he should consider that an original design by the party creating the combination, and for which he could maintain a copyright. It would be a new pattern, being all three put together, and he would sustain that, if anybody copied the three together. He could sustain it against witness, if he copied the three together, because if witness had them separately, and he put them together, he would say they were copied, because his was a new pattern from their being put together. He would be at liberty to copy the pattern of each of those three heads, and the combination of those three together, would give him the originality of that design. "I think he would get an injunction against me if I put the three together when I having only two before." Patterns being brought to the doors of printers by parties who obtain their living by designing, and by selling those patterns, it is quite open to those parties if they do not maintain good faith, to sell the same patterns to different persons. For instance, a man might sell a design to a house in Glasgow and to a house in Manchester, so that it might be difficult from the period at which they were sold to say whether the house at Glasgow was really the proprietor of the original design or the house at Manchester. The way that many will do is—they say to a designer, "draw me a set of patterns like these;" he draws a set of patterns not exactly like those, but something similar, and then, after he has drawn that set of patterns, the calico printer says, "Why, I do not much like these patterns of yours, you have drawn me half a dozen, I will only take two," and he pays him for two. Then the man goes and sells the others to somebody else, and those patterns are imitations of the very patterns that he has sold to the other gentleman; therefore, whoever gets the patterns out first and stamps them as being the original proprietors of those patterns, can get an injunction against any other. Means to say that the party who purchases the rejected patterns and published and obtained a footing for them in the market, before the party buying the best patterns of the lot submitted to him might move for an injunction to restrain the other party from publishing his, because of a similarity. Has stated that in thirty years' experience only knew of two original designs having been produced; those that he had never seen the shape of before. One of those was the Diorama pattern. It was produced by accident. It was produced by Simpson: he had got a stripe, and in his stripe he was printing a pattern shaded off, and he sold that print in that shaded way. The man was printing it, and after he had printed a certain quantity of pieces, as one piece was going upon the blanket the next piece he was printing came in another shape on the other side, and it just cut a little across the pattern, and in consequence produced this Diorama pattern, of which he believes he delivered 25,000 pieces in one day.

The Committee were to understand that that pattern was decidedly the result of pure accident, and that was one of the two patterns to which he attributed the character of originality. Has known but one other pattern which he considered entitled to the character of originality.

Has drawn a distinction between that which is considered in the trade to be a copy and that which would not be considered so by the public, according to the proper use of the terms, *i. e.* the distinction between a facsimile and an imitation of a pattern.

Has stated that there was a peculiar and technical understanding of the word "copy" in reference to printed calicoes, which would not be understood out of the trade, and which was at variance with the general meaning of the word apart from that technical understanding.

Here is a pattern called a rainbow-pattern (producing a pattern). "Now in all our styles last Spring, after the trade had gone on some little time, we brought out this rainbow; and after that other people brought it out, and in fact we had others then copying us: although they only copied the styles, which is worse than copying even individual patterns, because an individual pattern is not of so much value as a whole style is. Now this Spring my traveller has gone to Glasgow; he has met with another traveller there, from a first-rate house. These travellers, when dining together, show each other their patterns; and he writes me word that they have seen each other's patterns, and they are just the same. The reason of that is, that now there is a rage for shades, they do not care about the difference of pattern if they have these shades: and that house and ours are now both doing the same kind of thing, and it is all taken from this." Calls these specimens originals, and if any person does that style, says that he copies him. If it were to become the subject of an application to the Court of Chancery for an injunction, the Lord Chancellor would say, perhaps, that it was not a copy, because it was not a fac-simile; so that although, technically speaking, it might be alleged to be a copy, (not being, however, in the just and fair understanding of the term, and in public acceptation, a copy) it is his opinion that the Lord Chancellor would go

with the ordinarily received and proper interpretation of the word, and not with the technical interpretation put upon it by the trade —he would just go the wrong way instead of the right way. The Chancellor would say it is a copy, but witness would say it is not a copy, because it is not a fac-simile. His Lordship would leave the two designs unfettered; but calico printers would say they are copies, though the Lord Chancellor might say they are not, because one is a check and the other a stripe. Speaking not as a calico printer, but as an intelligent individual, conversant with these questions considers that in the case now before the Committee there ought not to be a copyright.

Mr. Edmund Potter, is a calico printer at Manchester; his establishment for designing is not very expensive, his designs being chiefly made by himself. Has occasionally found very serious loss from the copying of his designs. A simple and novel design is the most valuable and the most difficult of attainment, and is the most easily pirated. Novelty in design, decidely constitutes the great feature of the excellence of one country in that branch of art above another, and novelty is promoted by giving adequate protection to design; without remuneration there can be no novelty, and we must have protection in order to obtain remuneration; whereas the system of copying has every tendency to produce sameness and to repress novelty. Has been in business as a calico printer fifteen years; during that period both the mechanical and chemical processes for facilitating the reproduction of patterns have been greatly improved. The production of original design, being a mental process, there has been no accelerated speed in that; so that the copyist derives great advantage from the increased facilities of reproduction. Does not think the present term of copyright a remunerating protection; thinks an extension of the term to twelve months would give a fair adequate protection. Does not consider copyright is connected at all with colour; should consider a copyright pirated if the design was used, although the colours were altered. If witness had a successful design in certain colours, and another party brought it out in different colours, should say he was liable to an injunction: the design is the basis of the pattern. Has never found any great difficulty in ascertaining what is an original pattern. Has never heard of any difficulty in ascertaining what are original designs and what were copies; has met with no such difficulty in practice. The protection afforded by copyright increases the necessity for superior art: of course it adds value to original productions and encourages native talent. Copying extensively from the original designs of other parties is decidedly injurious to the cultivation of original genius. Does not think that with the present extent of copyright, sufficient encouragement is given to persons of original genius disposed to devote itself to this branch of business. Knows of instances where men have been brought up to this branch of business, but have quitted it for other occupations of an analogous character, but of a superior class, from not meeting with sufficient remuneration. The late Mr. Stothart, the painter, was originally a designer for a calico printer; and Mr. Lonsdale, the painter, was another instance; both of them left it from want of sufficient remuneration. Has heard it stated that Mr. Oldham, the designer of the notes of the Bank of England, was connected with calico printing, and that he quitted the trade for want of sufficient encouragement. A longer copyright exists in favour of some other descriptions of analogous productions of taste and genius, than is enjoyed by printed calicoes. Believes almost every other description of art has a longer protection than calico printing. Knows that the duration of copyright for all designs in metal is three years. The duration of copyright in woven fabrics is twelve months.

They have a flourishing school of design at Manchester. They have a pretty good attendance of scholars; believes nearly equal to that of the London school.

Considers those establishments likely to be decidedly serviceable to his trade. Is one of the Council, and in pretty regular attendance at the Manchester school. Is of opinion that they would be more serviceable if copyright were extended. Asked which of the two he considers would be most serviceable independently of the other, the existence of schools of design, or an extended copyright? Answers, an extended copyright would produce more schools of design, and if only one could be obtained, should prefer an extended copyright first. Thinks that would be most serviceable to the originality of production on his goods, that it would lead to the other, and would eventually be the most serviceable.

Considers that the pupils now in the School of Design in Manchester would receive much more encouragement if the copyright were extended to twelve months; because a greater number of original designs would be wanted, and therefore there would be more employment for artists. Knows no reason why there should not be as great a protection for cotton as for woven goods. Is aware that the greatest quantity of goods is produced by small capitalists, who are opposed to the extension of copyright; but there are large capitalists who are notorious pirates. In point of fact, the producers of the greatest quantity, *i. e.* of a low class of goods, are opposed to an extension of copyright. Has no objection to registration if

it can be made to work fairly, but objects to the open exhibition of patterns; paid 5*s.* last week, and saw what designs they had without anything being stated against it. Thinks there would be no difficulty in determining before a jury whether a pattern was original or not.

Mr. E. Brooke, (of the firm of John Lowe and Co.,) has been twenty years engaged in the furniture branch of calico printing at Manchester; a perfectly distinct branch from the garment printing. Prints from original designs, which are of a much more elaborate and expensive character than those for garment printing. Engraves about fifty patterns annually, but does not adopt one in ten of those proposed. After a pattern is drawn, they have to consider whether it is worth engraving. His goods are sometimes copied by other houses, who are at no expense for the design and have no risk, as they confine their copies to those patterns which have proved to be successful. The present amount of protection, three months, is not at all sufficient to afford adequate remuneration; considers twelve months at least necessary. If he had an additional protection, it would be an inducement to go to a greater expense with a view to produce greater variety and richness in his designs. Is aware that there is considerable difference of opinion in the trade at Manchester as to the propriety of extending the copyright. Witness has not considered the subject of registration so thoroughly as to be able to give an opinion; his present impression is decidedly against registration. Considers his interest would be injured very materially by registration under the present system of exposing the patterns to any person asking to see them. If the registry could be adapted to his branch of trade, without exposing the patterns, should have no objection to it. His main objection is to exposing the pattern; another objection is the expense. Thinks that in matters of copyright, a summary jurisdiction at petty sessions by two magistrates would not be a satisfactory mode of deciding such questions. Knows several gentlemen engaged in the trade of calico printing, who are magistrates in Lancashire, who are themselves pirates, and would not like to take a case before them.

Mr. Charles Warwick, is partner in the house of Ovington, Warwick and Co., in the city, who have a branch of their business at Glasgow; are extensively engaged in the printing of woven fabrics, generally mixed fabrics, such as silk and wool, cotton and wool, challis, cashmeres, mousselaine-de-laines, &c. Original designs for these fabrics are made by their house, the cost of which last year exceeded 2000*l.* In 1835, witness endeavoured to get up petitions to the legislature in order to obtain protection for their articles. He considered that as the cost of the materials upon which they printed was of greater value than the calico, they ought certainly to have protection; a calico print of 2*d.* a-yard was protected, while the article produced by them, sometimes costing from 5*s,* to 6*s.* a-yard, had no protection. Did not succeed in getting up a petition, and could not make any way in 1835. The fine challis were first printed in this country in 1826, shortly after allowing French goods to be imported. The original word "mousse-laine-de-laine," means a woollen muslin; that article was entirely French, and it was not printed for some time. Witness introduced an article made of wool and cotton, which he wished he could have got a patent for at the time, for it would certainly have given him an enormous property. He supposed that he could have got protection for that article under the Cotton Bill, it being composed of cotton and wool; finding that a challis had no protection, being silk and wool, he endeavoured to manufacture an article of cotton and wool, thereby supposing he could get protection under the Cotton Bill: thus inventing an entirely new article of manufacture, in which there has been an immense trade. Upon the first introduction of this article, they were not openly opposed; there were a few pirates, but could not tell who they were; they were persons of very little character, who did not like to be seen by daylight. Witness and his partners went on paying more attention to getting originality of design, and not caring for the opposition they met with till the year 1838, when they had made improvements in the article of mousseline-de-laine, which could not be manufactured so well at Glasgow as at Norwich. The Norwich trade having been for half a century entirely engaged in the manufacture of silk and wool, they were able to overcome some difficulties which our weavers could not do. In Glasgow the weavers wet their wefts, in Norwich they do it entirely without, consequently they made an article very superior, and witness was obliged to continue the manufacture of mousselaine-de-laine at Norwich, which, in February, 1838, they had brought to a very great perfection. "In the years 1836 and 1837, our mousselaine-de-laines were copied almost as soon as produced, but it was by persons of no eminence, and their articles were of such inferior quality that it did not interfere much with us." In 1838, a circumstance occurred which induced him to seek more earnestly for protection. During the winter months he had been endeavouring to get an article of superior fabric, and, as was their usual custom, they were to make their first spring deliveries on the 20th of February. On the 12th of February, Mr. Thomas, a buyer from the house of Messrs. Morrison and Co., requested to be allowed

to have 27 dresses which he had selected; to this witness said he had the most decided objection; that he would not do for Messrs. Morrison what he would not do for any one else; that it was imperative upon him to have a delivery day, and not to give a preference. Mr. Thomas replied, "Oh! I have looked these dresses out, no soul shall see them; we are just packing a case now, and they will be shipped this afternoon for the foreign market." He said he had a memorandum to buy so many dresses, but witness did not look at his memorandum, taking it for granted that what he stated was correct, and having done business with Morrison's to a great extent for some years, he put faith in their representative; the consequence was he ordered the dresses to go. There were 27 dresses, containing eight patterns, but different colours. On the 19th, according to his usual custom, witness wrote a few notes to the principal buyers stating that his house would be ready on Wednesday, the 20th, to deliver their new goods. On that day two of his own customers, with whom he expected to make large parcels, called, and showed him a note from Mr. Thomas, stating, "Before you buy Ovington's goods give me a look in." One of the gentlemen said to witness, "I do not understand the meaning of it myself; can you explain it to me?" Witness said he could not, and wished them to go down and see what it did mean. The gentleman accordingly went to Fore-street on Wednesday, the 20th, and was shown those dresses that had been obtained under the false pretence of shipping, and was told, "Those are Ovington's goods at 22*s.*; now, on Saturday, the 23rd, we make our delivery of those eight patterns in all the various colourings; we shall bring them out at 15*s.*" That was the first time witness ever had a patron for piracy; the piracies generally before that were of the most mean, contemptible, shabby description; people were ashamed to be seen in the street who had been guilty of piracy in London, except in very low trades indeed. This was the first instance in which their property had been assailed by any one of any consequence; it perfectly paralysed their trade altogether. Theirs was a description of goods which did not come under the protection of the existing law, and the effect on their property in that pattern was ruinous to them. Witness was enabled to trace his goods, and found the copies were produced at Glasgow. Other houses followed the example of Mr. Morrison's to such an extent as to paralyze witness's trade; one set of designs being frequently copied by three or four houses, and this tended to work a most astonishing change as regarded the pirates themselves. In 1835 witness could not get a petition from Glasgow, but in 1838, he could not only get a petition, but he could get large funds for the purpose of getting protection. To show that they were in earnest he received 197*l.* 6*s.* from Glasgow, as the treasurer, to carry out measures for obtaining protection. The copying of one design by three or four different copyists tended to produce a change of feeling among the pirates, because they opposed and undersold each other. Under this state of circumstances, he applied to Mr. Poulett Thompson at the Board of Trade for protection, and stated the facts, who promised to give the subject his earliest attention. At the close of the year 1838, a copy of a proposed Bill, which Mr. P. Thompson intended to introduce to the house, was sent to witness, who thought it so objectionable that a committee of the trade was called together, and a subscription entered into for opposing the Bill, provided it was brought in; it had a registration mixed up with it: it had also a power of appeal before magistrates; those clauses were considered very objectionable. A Bill was prepared by the London Trade Committee in connection with those of Manchester and Glasgow, the objects of which were to carry out the protection of the Copyright Bill for twelve months, and also to include silk, wool, and mixed fabrics.

A deputation waited upon Mr. Poulett Thompson with a copy of the Bill prepared by the trade, to which he objected. He subsequently brought in two bills in that session of Parliament, which became two Acts for regulating this trade. The fabrics referred to by witness were included in the bill called "An Act for extending Copyright of Designs for Calico Printing to Designs for Printing other Woven Fabrics;" by which the trade obtained a protection for three months without being liable to a system of registration. Mr. P. Thompson was not aware that they had so excellent a mode of registration among themselves, as that of printing at the end of the piece the date of publication, which he considered far superior to any mode of registration that he could possibly adopt; it was less objectionable to the trade also, and in deference to their opinion, he brought in a separate bill to carry out the Calico Bill for the protection of mixed fabrics; the trade waived the question of time, feeling it most important to have the protection recognised at all, upon those mixed expensive fabrics; the trade accepted the three months' protection, with the understanding that they would at a future period apply to have it extended to twelve months. The bill originally tendered by Mr. P. Thompson offered twelve months protection, provided they would accept the registration, which was declined, being considered an evil which counterbalanced all the advantages of the extended copyright. In the first place, according to the Registration Act, the expense is a guinea for

registering, and a search for a design five shillings. The number of witness's designs being annually about 500, would make the expense 500 guineas a-year. On the ground of expense, thinks there would be no objection if it was reduced to 1*s*. or 2*s*. per design, but he has a greater objection to depositing three copies of their pattern. Another objection to registration was the publicity given to his designs, and the facility afforded for copying; but it appears they have a new rule now not to show designs, which is a recent regulation. He objected to the jurisdiction given to the magistrates by Mr. P. Thompson's bill, but owns that it is not so objectionable as at first considered, as they still have the power of applying for an injunction. If an extension of copyright were given, it would enable him to give increased employment to original designers and to artists. Should say a material change had recently taken place in the minds of the trade with regard to the necessity for an extension of protection. Persons who are attending to the production of original designs are now most anxious for carrying out the protection bill. Has produced an article of manufacture upon part of which there is a printed flower, and upon another part a woven flower, for the woven flower he has twelve months' protection, but for the printed flower only three months. It seems a great anomaly, that upon the face of the very same article he should have three months' protection only for the one part, and four times that period for the other.

From 1835 to 1838, witness had not been molested by piracy to any great extent; there were persons who did it, but in a small sneaking way. Was not annoyed until that transaction took place with the house of Morrison; until that time, the copies were so inferior that they did not much interfere with him. Since that transaction which took place in February, 1838, has been copied to a great extent. None of the patterns now before the committee have been copied—they are not likely to be copied; they are not suited for the common low rubbish that most of the pirates live by selling. So that a very superior pattern, without the aid of the law protects itself. This pattern is only fit for the drawing-room; it is not fit for the cook. Has been copied since Mr. Poulett Thompson's Act, giving three months protection was passed, but one advantage from the Act is, that there have not been literal copies; it has not been done by merely employing tracing-paper, but it has been by taking the style and hits of pattern. A class of persons have been employed to produce these copies latterly of a different kind; in point of fact, artists; and they require generally to be men of very great talent who can do that, which is a thing witness does not complain of. So that since the passing of this Act, although there have been some copies, generally there has been rather an imitation of style than a transcript of pattern. This Act has now been in operation six months, and from experience should say three months protection is not sufficient for the encouragement of the superior class of artists, and for the encouragement of original design. Should say, from the number of names attached to the petition, there must be a large body of manufacturers engaged in copying the designs of others. It would be no injury to trade to restrain these people from copying for twelve months; it is no advantage to a poor person, that she should have a dress of the same pattern as her mistress.

Mr. Thomas Barker Holdway, late of Edinburgh, now of No. 7, Edmund-place, Aldersgate-street, a teacher of pattern drawing, and pattern designer generally, has been engaged in that profession since 1822. Is employed generally for carpets, printed garments and shawls; has also drawn patterns for paper-hangings, muslin collars, &c. Has been particularly successful in the shawl way; has received premiums for carpet patterns and also for mousseline-de-laines. Has been employed as teacher to the Honourable Board of Trustees for Manufactures in Scotland since January, 1836. Has turned his attention generally to the question of design, and to the protection which ought to be afforded to designers in this country. Does not consider the present term of protection extended to original designs for manufactures, is a sufficient remuneration to persons embarked in that business. Is decidedly of opinion that the interest of both those persons would be promoted by an extension of that term. According to the varied manufactures to which it might apply, the protection should vary; it would be a less time for some and longer time for others. One year, at least, would be necessary to give an adequate protection in the case of calico printing. Is aware that the French have a system of protection and registration for their original designs, and attributes the superiority of the French in the novelty and originality of their designs, to the superior protection afforded them. It would be for the advantage of original designers if the present period of protection were extended, because the manufacturers would be able to pay them a larger price for their productions. Conceives that there would be a greater demand, and greater necessity, in fact, for novelty, if copying within a certain period—say twelve months—were altogether prohibited; and that there would decidedly be an increased employment for original designers. Has sometimes had seven, sometimes three or four pupils in his establishment; has had ten at one time, but the

number varied, and the locality where it was placed was not so favourable, being located in Edinburgh, where manufactures have rather retrograded than advanced; thinks the reason they have retrograded, was the system in which the shawls were copied, which has tended to take the manufactures considerably from that place. Has experienced an unwillingness on the part of parents to send their children to learn the business of designers, from a doubt of the practicability of finding adequate employment for them afterwards. Has turned his attention to the necessity of registration for original designs, and is of opinion that in most manufactures a system of registration is indispensable. Is acquainted with the system which has been established under the Act brought in by Mr. Poulett Thompson in the last session of Parliament, and considers it very objectionable. His first objection is to handing in three copies of every design. He called at the Registry Office in September last, and presented three patterns, now produced, for the purpose of getting them entered for protection, but found that unless he lodged three copies of each design he could get no protection. Now each three would have cost him 30*l.* or thereabouts.* He would have considered it more difficult to make a copy than an original, and he would have charged more for the copy than the original; there would have been more labour in it, and he would have disliked it more; because he could get through the original more easily; it might be somewhat different, but in a copy he would have to adhere strictly to the pattern. There is no obstacle to depositing shawls instead of a drawing on paper, but the shawl produced would cost as much as the original pattern; the shawl might come to 7*l.* or 9*l.*, and that would come to nearly the same; it might be made cheaper, but, if made well it would come to 6*l.* or 7*l.*, or from that to 9*l.* These shawls are at present included in the protection afforded by the bill of Mr. P. Thompson (2 Vic. c. 17.); but witness is aware that the expense of depositing the shawls or the drawings has deterred the manufacturers from availing themselves of that protection. Considers the fee of one guinea, now charged on registration, is too high; has proposed 10*s.*, but, with an excess of business, even less than that might do; thinks the sum might be reduced to something near the French, which is one franc for each year's protection sought. Another objection to registering shawls is, that it would be very inconsistent to have a stamp on any part of it. This, however, might be obviated, by having a small mark, which might be put on by the manufacturer, and only known to manufacturers. Could put a mark on the shawl that no lady would see, but which would be known to the trade: such mark corresponding with that put on the pattern at the registry-office. Besides the expense and disfigurement arising from the present system of registration, conceives that publicity would be an objection to the designer and to persons who are proprietors of patterns. The registration should be done with the greatest secrecy possible, particularly as regards one part of the trade with another; as far as tradesmen are concerned, no one should see what another has deposited; this is the French system. Conceives that the penalties for the infringement of a copyright, under Mr. P. Thompson's bill, are not a sufficient protection; suggests the fine should be augmented according to the value of the article pirated. Objects to the tribunal being two magistrates, because it is very possible to find a magistrate who knows nothing of colour, knows nothing of design, and perhaps never saw any machine whereby to decide upon it. It is to the incompetency of the tribunal he objects; should say that a magistrate ought to have the power of calling in practical men, in the same way as in some of our courts in some places. In Edinburgh they have a lawyer, who assists the magistrates in their duty. Now witness would have an artist attached, and a practical manufacturer, or perhaps two. Has heard that three months generally exhausts the sale of an article, but he should think it would not; for if three months exhausted it, there would be no reason for the copyist following it up at the end of that time. It often happens that it is worth the while of the copyist, at the expiration of the 3 months' protection, to produce his imitation, calculating upon an extended sale. If the protection were extended to twelve months, thinks that would pretty nearly exhaust the sale; it would therefore not be worth the while of the copyist to continue it after the twelve months. In order to continue his business, he would be driven to produce new designs, and consequently an increased quantum of employment would be given to original designers. In proportion to the original number of designs produced, it would follow that there would be a demand for engravers to cut them. So that an increase of the term would not only create a demand for original designers, but give increased employment to the engravers of those original designs. Has studied something on the point, and will state to the Committee what he considers to be an original design. All design is derived from the line and the circle, or a part of the circle: the objects which compose patterns are obtained from those combinations. A pattern is the grouping of those objects. It is very true that he may not get a very great number of new ob-

* It would have been more correct to have said 30*s.*—Ed. M. M.

jects; but, by proper attention to the harmony and grouping of the line and circle together, he may create very different objects. There are a great number of objects used in the various kinds of patterns, and those objects being judiciously thrown together compose a new pattern. He will illustrate what constitutes an original by a simile. He considers that in music there is a certain number of notes, and a composer in music has to use every one of those notes, and by transposing them he creates a great variety of airs, and they are said to be his composition. Witness has fewer materials than the composer; he has but a part of the circle and the line; upon those all designs are founded, and he must groupe and transpose those objects created from these materials into the most harmonious and pleasing effects, so as to create a good design. Suppose a musical composer were to sit down to compose a piece of music, and he were to borrow a certain portion of that music from Italian, German, Scotch, Irish, and English composers, and make a new piece of them; and suppose that each part could be detected as coming from the music of those different countries, still he should consider that composition an original composition, it would combine a number of styles, just in the same way as he would make a pattern that would combine two styles. Though there should not be a single idea originating with the composer, he should call it an original composition—should say it would be very singular indeed if it did not possess a great deal of originality, from being compounded of so many different sorts There is not an original idea in it, it is all compounded; but so you may say of the notes of music: you find the music is founded on a certain number of notes. Although it is talent borrowed from others, talent for invention is improved by making good use of what you have, and grouping what you have. You cannot conceive invention to be perfect or improving without that; should say, in his own opinion, that a great many of the patterns then before him were copies of each other. It is not his custom to take ideas, in the formation of his designs, from other designs. Has stated that he consults other designs, and considers that a person ought to have a good collection of designs, that he may vary his own; it is by seeing designs that he is is enabled to do so; but considers that a person only copies a design when he takes it as it stands. Supposing he had before him two designs, having three objects upon each of them, and he was to compose a design, taking two objects from one of them, and one from the other, should consider that an original invention; but if a person took a very great portion of any design should blame him as being a copyist. During the fifty years the law has been in existence, a vast quantity of patterns have been designed, which may be calculated at many millions, but the imagination has not been exhausted; considers that the invention of designs must be rather on the increase than the decline, in consequence of the numbers that have been invented, and that there is as much scope as ever in the branches of fancy trade for every manufacturer to invent for himself—the inventing of patterns is *ad infinitum*. Notwithstanding that ideas have been ranged together in countless millions of patterns, still it is possible to introduce new ideas. Cannot say what form or figure he should now invent; but if he had protection should be more anxious to think than he is at present. Has had some pupils under instruction in pattern-drawing; he caused them to study old designs, of which he kept a stock for that purpose. When those pupils compose patterns of their own, if they do not copy directly from the original pattern, the ideas must be impressed upon their minds entirely by the numerous objects which they had placed before them; and this is requisite, as they could not learn what description of pattern was necessary for a particular branch of trade without making use of them. Does not consider it a difficulty amounting to impossibility to invent an original design; because if he were inclosed in any place, with working materials, but without any pattern to copy from whatever, he could produce a new design, different from any thing previously produced, and he could find others who would do the same. Has not drawn many patterns this year; has not drawn so many within these two or three years as he used to do, but cannot say how many—it depends on getting orders. He used to draw a good many, and keep them for sale; but found he ran great danger in showing them. Could cite a case which would deter any man from making patterns. He went into a house in Paisley, with a lot of patterns to dispose of. The master looked at them, and said, "I am going to take these into the room where my drawers are, to show some of them." Said, "If you take them into that room they are yours—they are yours for 11*l*." He took them into the drawers' apartment and brought them out again, threw them down on a table, and seemed to pay no more attention to witness; he kept on and said he would not take take them back, and insisted on their being kept. A short time afterwards the foreman said, "You had better take them, because they have been in the other room, and they are not worth so much to you as they were before being shown to the drawers." Replied he should know where to bring his designs to again. He appealed to the gentleman, and at last obtained his money. The exten-

sion of the time of protection would enable him, if he made a good design, to register it before he showed it, and if any party took it after that, he would be answerable.

(To be continued.)

COMMON ROAD STEAM CARRIAGE OF M. DIETZ.

According to the French press, M. Dietz has been running a steam-carriage in the neighbourhood of Paris, with great success. The following particulars respecting M. Dietz's steam-carriage are gathered from the Reports of the Academy of Sciences, and Academy of Industry, at Paris:—

M. Dietz's carriage has eight wheels, two of which are larger than the other six, and give the impulsion. The six smaller wheels rise and fall according to the irregularity of the ground, and at the same time assist in bearing the weight of the carriage, and in equalizing its pressure, &c. The wheels, instead of having iron tires, are bound with wood, under which there is a lining of cork, in order still further to deaden the noise and prevent shocks which would otherwise derange the mechanism of the carriage. This wooden binding is secured by an iron circle, which does not touch the ground, and is so contrived as to be exceedingly durable. Another improvement of M. Dietz is a mechanism by which all the carriages of the train which are drawn by the engine (for he does not propose to carry either goods or passengers in the steam-carriage itself) are made to follow in the precise line of the wheels of the steam-carriage, which is so regulated by the six smaller or flexible wheels, acted upon by an endless pulley chain, that they describe any curve at the will of the conductor. M. Dietz, proposing to draw only from thirty to forty thousand pounds, has made his engine of thirty-horse power, calculating the power of traction of the horse at one hundred and fifty pounds at a speed of two hundred feet per minute; consequently, he has a force capable of surmounting every obstacle, and is at the same time able, in case of necessity, to double the power by a simple combination of pulleys. The great merit of the invention of M. Dietz is said to be in avoiding the expensive repairs which have hitherto been the greatest obstacle to the use of steam-carriages on the common roads in England. A commission from each Academy accompanied M. Dietz in one of his experimental journeys from Paris to St. Germain, and report that it was performed at the rate of ten miles an hour, and that the hill between the Pecq and St. Germain, which is one of the steepest within twenty miles of Paris, was ascended in less time than is occupied by the diligence; which, so far as speed is concerned, falls considerably behind many of the English performances. They state, also, that when the steam-carriage was compelled to deviate from the paved road to the unpaved sides, the return was accomplished without difficulty or danger, by the ingenious contrivance of the extra wheels, which kept the engine in the equilibrium. This principle does not indeed apply to the carriages of the train; but as they are so constructed as to present little danger of upsetting, the deficiency is of no importance; and if it were found to be so, it would be very easy to extend the principle to the whole of them. The power of returning without danger from the sides of the road to the pavement, is one of great value in France, for nine accidents out of ten which happen in the ordinary coach travelling, arise from the difficulty of regaining the *pavé*, without losing the equilibrium. On many roads the *pavé* is too narrow for two diligences to run abreast, and when they meet each other, one of the two, if not both, must deviate a little from the centre. The *pavé* is very much rounded for the purpose of keeping it dry; and in winter the sides of the road are loose and rotten, so that the wheels sink several inches below the edge of the paved portion of the road. The danger, therefore, in regaining it is very great. If M. Dietz had not obviated it by his ingenious contrivance, not only would his machinery be subject to shocks, which would render frequent repairs necessary, but the engine itself would be very liable to upset.

All the evidence, as far as it goes, appears favourable to the invention of M. Dietz; but the proof of its utility, as in all such cases, is still to be given by carrying the invention into practical and daily operation.

WHITELAW AND STIRRAT'S PATENT WATER WHEEL.*

(From the *Paisley Advertiser* of September 19.)

In February last, we noticed one of those newly-patented mills, erected near Howwood, and gave a brief account of its general appearance and advantages. We then stated that, as far upwards as 20 horse power, the principle had been fully tested, but that doubts were entertained by some, whether it would hold equally good, as the power increased. This has now been tried, as far upwards as 60 horse power, and to this extent the soundness of the principle is as fully proved, as it was with a wheel of one-twentieth of that power. The trial we allude to, was made at Greenock on Wednesday last, in presence of a number of shareholders in the Shaws Water Works, proprietors and Managers of mills on the line of falls, and

* For notices of this mill, see *Mech. Mag.*, vol. xxxi, page 77, 79, and 416.

under distinguished gentlemen of Greenock, interested in the general progress of discovery and improvement. We shall now give a brief notice of the trial made, with a few other remarks, which may call public attention to the importance of this new mode of applying water power.

The wheel now under notice, is erected on one of the falls of the Shaws Water Company, on the rising ground above Greenock, and is intended to drive the machinery of a wool spinning mill, nearly ready for the reception of its machinery, belonging to Messrs. Neil, Fleming and Reid.

The proprietors of this work being the first that ordered a patent mill of such power, very naturally felt some anxiety about its success. They therefore ordered it at a pretty early stage of their operations, in order that, if it should prove a failure, they might have time to fall back on an ordinary wheel, without keeping their machinery long in idleness. The object on Wednesday was to test its powers fully, before it was set to work.

Our space does not admit of going into full detail, and we shall let it suffice to state, that the most approved form of friction was applied. The speed was varied by the application of weights to the friction lever, from 62 to 104 revolutions per minute, but the speed for which it is best adapted, is 90 revolutions per minute, at which rate it went when 560 lbs. were applied to a lever 40½ feet in circumference. Its power is that it lifts 2,041,200 lbs. one foot high per minute, or in other words, it is above 60 horse power.

The height of fall is 30 feet, and the quantity of water used, as nearly as may be, 1,300 cubic feet per minute. The power produced by this column of water on an overshot wheel of the best construction, would be about 53 horse power; there is, therefore, a balance of about 7 horse power in favour of the Patent Mill.

But this does not show its advantages fully. In an undershot mill, where the fall is but three or four feet, the power obtained is only about 33 per cent. In the more favourable case of a breast mill, with a fall of 10 or 12 feet, about 60 per cent. is obtained, and in an overshot wheel of about 30 feet, not more than 70 per cent., under the most favourable circumstances, is obtained; while in the case of the patent mill, the gain is equal to about 80 per cent.. To this may be added, that whether the quantity of water be abundant, with a low fall, or scanty with a high fall, the new mill is calculated to reap alike from both all the derivable advantages.

There is another point, too, wherein the patent mill has a very decided advantage over the common water-wheel. A water-wheel of 30 feet diameter makes about two revolutions per minute; hence, to bring up the speed necessary for ordinary manufacturing purposes, a great deal of gearing must be made to intervene. This will frequently occasion a loss of three or four horse power—a loss which is avoided by giving a revolution of 90 to the first moving shaft, while all the expense of the intervening gearing is saved.

The subject of expense is in this, as in most other cases, a question of primary consideration; and, in this respect, the advantages of the patent mill are still greater than in the case of power. A water-wheel and its arc suited for the woollen mill to which we have been referring, would cost about 1,500*l*., or, adding the pipes for conveying the water to the wheel, about 1,700*l*.; while the price of the patent mill, with its conducting pipes, will not exceed 500*l*.!

As the height of the fall increases, the advantages of the patent mill increase in a still greater proportion. This may be illustrated by a comparison with a cotton mill on the same falls, a few hundred yards down the stream. The cotton mill has two falls conjoined, or about 60 feet; the water being the identical water used by the woollen mill, is, of course, precisely the same in quantity. The wheel to be used by the Cotton Spinning Company is of 70 feet diameter, length of float-boards 12 feet, giving a power of 110 horses. The cost of this wheel, with its arc, and with the other works immediately connected with the conducting the water to and from the wheel, will not cost less probably than 8000*l*., while to adapt the wheel of the woollen mill to drive the cotton one, the extra expence would not have been above 200*l*., or 700*l*. altogether.

The appearance of the patent mill we have on a former occasion described, and need not here dwell upon it. The principal difference we noticed between this one and the one at Howwood, is, that the latter has three arms, the former only two, which still further simplifies its construction. The pit in which the Greenock mill works, is formed of solid masonry, not circular however, but square, this form being the cheaper of the two, while it has the advantage of preventing, to a certain extent, a circular motion of the water after it has left the mill. In looking down upon the mill while in motion, it looks like a large-bodied sea snake, coiled up and making its angry circumlocutory gyrations in a boiling surf.

The four most prominent advantages of the patent mill over the water-wheel, are, *first*, its first cost is a very great deal less; *second*, it produces more power with the same column of water; *third*, it is better adapted to every kind of fall; *fourth*, it adapts itself by the regulating power of its governor far more effectively to the varying work it may have to perform. Its secondary advantages are, that it is more speedily fitted up; it re-

quires far less room, inasmuch as its pit may be floored over, and no space lost. The quantity of material being small, it admits of easy removal, and its simplicity of construction is so great, and its friction so little, as to remove almost everything like tear and wear.

On the whole, we conceive, this is one of the most remarkable improvements ever made in the application of water as a moving power. The wasted resources of mountain streams which, both in this and other countries, it may bring into useful operation are incalculable; and we feel we are but doing our humble duty to science in giving it all the publicity we can. The improvement is not speculative; its practical working may now be seen in this country, from a mill of three horse power up to one of sixty, and from a fall of five feet up to one of thirty; in all cases the results being in proportion to the weight of the column of water in motion. Persons therefore who have it in contemplation to make use of water power, may have the best of all evidence of the superiority of this new mode of its application, namely, ocular demonstration.

* * * * *

The establishment of the Shaws Water Company, cannot but form an important epoch in the History of Greenock. Before that event, its supply was scanty; now there is not perhaps a town in the kingdom better supplied with that most precious commodity. But it is not the supply for domestic purposes alone, of which it has reason to be proud. Here is a supply of 1800 cubic feet per minute, for hydraulic purposes, running 12 hours a-day from Monday morning to Saturday night, all nicely regulated by self-acting sluices. How beautiful! On this splendid run of water, flowing from an altitude 500 feet above the Clyde, there are 18 sites for public works, with a fall of 50 feet each, and 14 of these are already engaged, while another stream of equal magnitude, affording sites for 15 other public works is in reserve, and will be forthcoming when a demand arises. Here, indeed, is a source of wealth, and one which, as long as ocean evaporation goes on, as long as clouds float and rain falls, will prove inexhaustible. But we cannot do it justice at the tail of a long article.

We may observe shortly in conclusion, that these splendid hydraulic resources are prodigiously magnified by the invention of the new Patent Mill. Instead of carrying factories up hill to the stream, the Shaws Water Company may now carry the stream down to the factories. The formation of the west branch of the Shaws Water is now unnecessary, and the expenses of the ground may all be saved. They can bring down their reserve stream in an iron pipe, in any convenient direction, without waste of surface ground, and give off power from one horse and upward, with as much facility as they could supply gas!

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

ISHAM BAGGS, OF CHELTENHAM, GENTLEMAN, *for improvements in engraving, which improvements are applicable to lithography.*—Enrolment Office, September 16, 1840.

This patent is for an ingenious combination of a swinging frame and tables, with a pentograph, by means of which a drawing can be copied either upon an enlarged or reduced scale, several copies being produced simultaneously; or, any required number of plates, dies, or blocks, may be cut or engraved (being copies of an original drawing) at one and the same time. The arrangements of the mechanism necessary for effecting these purposes, are very fully described, but could not be made intelligible to our readers, without the explanatory drawings. The mode of operating with this, as with other pentographs, is very simple; the perfection of its performance depending upon the accurate construction of the apparatus and the care and attention exercised in using it. The patentee is made to say, "*I would remark*, that in applying this apparatus to the purposes of lithography, I substitute '*unxious*' (query unctuous) or other suitable points, for the tracing points, or cutting instruments: and lithographic stones, for the metal plates." The claim made is, for the combination of the swinging frame with a pentograph as described.

THOMAS STIRLING, OF LIMEHOUSE, *for improvements in the manufacture of fuel.*—Enrolment Office, September 19, 1840.

This patentee observes that, several processes have been patented for making artificial fuel of tar, small coal, clay, &c., made into solid blocks by compression, which method he disclaims; his improvement consisting in the employment of heat for effecting the solidification. He does not claim any particular ingredients, nor the combination of any precise quantities, but uses and recommends the following: viz. one hundred pounds of vegetable tar, three hundred pounds of mineral or coal tar, and two thousand two hundred and forty pounds of small coal, sifted through a screen or sieve having six meshes or apertures in the square inch. The mode of making the fuel is as follows: the tar is put in an iron vessel of sufficient capacity, and when hot, the clay mixed with water to the consistence of thick cream, is added to it. This mixture is boiled, and while hot the small coal is gradually incor-

porated with it; when thoroughly mixed, the composition is put into a series of rectangular cast iron moulds, which are placed in a kiln or oven heated to 250° or 300°, where they are left for an hour or an hour and a half, after which they are set aside to cool. When cold, they will be found to have the necessary solidity, without being subjected to pressure. The claim is, for a mode of manufacturing fuel from small coal, tar, and clay, by submitting the same in moulds to a considerable degree of artificial heat, by which solidification is effected.

John Jackson, of Manchester, nail and bolt manufacturer, *for certain improvements in the manufacture of nails, nuts, bolts and rivets.*—Enrolment Office, September 19, 1840.

The subject of this patent is a new stamping machine, by which, it is said that the formation of the heads of bolts, nails, rivets, and nuts, can be more rapidly and economically effected than heretofore. This stamp consists of two upright square iron bars or guides, between which a heavy stamp or ram works vertically; in the lower part of the framing a drum is mounted on an axle having a winch handle at either end for working by hand, as also a fast and loose pulley for the reception of a belt from a steam engine or other first power. In another frame at the top of the machine, a second drum is placed immediately over the first; two parallel endless chains pass round these drums. These chains are of the construction known as fiddle-chains from the shape of the links; but they are, in this case, somewhat elongated, so as to leave an aperture between each pair of links. A series of pins project like radii from the circumference of the lower drum, which take into the loops or apertures in the chain, so that on turning round the lower drum, the chains are made to traverse; a heavy fly-wheel on the drum equalizes the motion—the work itself being intermittent. On the upper part of the stamp or ram there is a projecting arm, by which it is raised. At three equidistant points, cross bars connect the two endless chains, which cross bars coming alternately under the projecting arm of the stamp, carry it with them in their progress upward. Near the top there is a projecting forked piece of metal, against which, the cross bar impinges; the consequence is that the chains are pushed inward away from the stamp, which being disengaged from its support, falls with the momentum due to its weight, elevation, &c. upon the bolt or other matter placed on the lower anvil to receive its action. The form of the head, or nut, is given by a die attached to the lower part of the stamp. The speed of the apparatus must in some measure depend upon the expertness of the workman, as time must be allowed to remove the finished bolt, and to replace it with a piece of heated iron rod to receive the next blow of the machine. The discharging fork may be placed at any required elevation, so as to accommodate the force of the blow to the nature of the work to be performed. The various known parts and contrivances employed are separately disclaimed, the claim being for their combination in the manner and for the purposes set forth.

Francis William Gerish, of East Road, City Road, patent hinge maker, *for improvements in locks and keys, and in other fastenings for doors, drawers, and other such purposes.*—Enrolment Office, September 19, 1840.

The patentee observes that in large doors where great strength and security are required, it is necessary to have a lock of corresponding size, the key of which is large and heavy and therefore inconvenient for carrying about; to obviate this he makes a knob or handle perform the office of a key and throw the bolts; a lock contained within the knob, acted upon by a very small and portable key, has a forked bolt which locks into the escutcheon, and so renders the knob or handle and the bolts immoveable. The patentee also claims the method of throwing a bolt out from the escutcheon into the knob, and so producing the same effect.

Claim is not made to any particular arrangement of lock: in the specification a common tumbler lock is adapted to the purpose.

The difficulty which this benevolent patentee has undertaken to remedy, has no existence but in his own imagination. It must be pretty well known to most of our readers, that the iron doors of strong rooms, the doors of large iron safes, &c. have long been fitted with knobs performing the office of a key and throwing from four to ten, or even more, bolts; such knob being secured by a small Bramah or other lock fitted with the most portable keys, which threw a bolt into the wheel of the large lock, thereby setting fast the bolts, knob and all. The small lock in this case is safely placed within the door and is inaccessible; whereas if situated in the knob, it is only to saw open or knock off the knob, and all the security is gone.

The next claim is for a mortice latch, contained within a cylindrical metal tube; the bolt, which is also cylindrical, lays along the tube, and is squared and turned up at the end, and a rack cut on its under side; a pinion or sector on the spindle or axis of the knobs turns back the bolt, which is urged forward by a spiral wire spring coiled around it. This latch may be secured by a lock in the handles as before described. As regards originality, this contrivance is no better off than the former; the object is decidedly a good one, viz. to avoid cutting away the

wood to so great an extent as is necessary for the usual run of mortice locks; to let in this lock it is only required to sink a circular hole with a centre-bit, to the proper depth. Locks of this description, but infinitely superior in arrangement to the foregoing, have been made and used some years—invented, we believe, by Sir John Robison, Secretary of the Royal Society of Edinburgh.

The next *improvement*, is in the construction of tumbler locks, with keys having four or more projecting "nebs" placed around the pipe of the key. In lieu of Barron's plan of several steps on one bit, this patentee adopts a separate "neb" for each tumbler, the advantage of which is not very apparent. A little extra trouble in making the lock and key, but no additional security will be obtained.

The claims set forth are, 1. The application of a lock and key to a knob or handle of a lock to secure the same as herein described. 2. The mode of constructing a lock or other such like fastening, by combining a bolt, spring, and pinion or toothed sector. 3. The mode of constructing a key for locks and other such fastenings by having a series of nebs or projections around the axis of the key as described.

STEAM-BOAT CHALLENGE FOR ONE THOUSAND GUINEAS.

Sir,—Various paragraphs having appeared in certain publications tending to detract from the merits of the *Archimedes* screw-propeller steam ship, I consider the only way to determine the matter, after the successful performances that vessel has already made in circumnavigating Great Britain, and in her recent voyages to Oporto, Amsterdam, &c., is to publish this challenge—to run the *Archimedes* against any paddle-wheel steamer in the kingdom, the power of which is not superior, and the tonnage and draught of water not less than that vessel. The trial to take place in the *open sea*, over a distance of 100 or 500 miles, for *the sum of one thousand guineas*.

N.B.—The trial must take place before the 15th day of October next, and the challenge does not extend to vessels with *high pressure engines*.

FRANCIS PETTIT SMITH, Patentee.

1, Wade's-terrace, East India-road, London, September 16, 1840.

LIST OF DESIGNS REGISTERED BETWEEN AUGUST 29TH AND SEPTEMBER 25TH.

Date of Registration.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Aug. 28	394	R. Bettie	Gridiron	3 years.
31	395	T. Messenger and Sons	Lamp chimney	3
Sept. 10	396	G. Jackson and Sons	Ornament for glass frames, &c.	1
11	397	C. Griffin	Kite	1
"	398	A. Toy	Lamp chimney	1
14	399	S. Coote	Fire-hood	3
"	400	Ditto	Candlestick	3
16	401	H. Manton	Tops for castors	3
17	402	A. Bearne	Boot	1
18	403,4	J. Newcomb and Son	Carpet	1
21	405,9	R. Goodlad and Co.	Stained paper	1
22	410	G. Pratt	Lamp Chimney	1
23	411,12	J. Newcomb and Son	Carpet	1
"	413	Southwell and Co.	Ditto	1
24	414	W. Blackwell	Curling comb	3
"	415	J. Newcomb and Son	Carpet	1

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 30TH AUGUST AND THE 26TH OF SEPTEMBER, 1840.

William Daubney Holmes, of Cannon-row, Westminster, civil engineer, for certain improvements in naval architecture and apparatus connected therewith, affording increased security from foundering and shipwreck. September 3; six months.

Thomas Horne, of Birmingham, brass founder, for improvements in the manufacture of hinges. September 3; six months.

James Bingham, of Sheffield, manufacturer, for certain improved compositions which are made to resemble ivory, bone, mother of pearl, and other substances applicable to the manufacture of handles of knives, forks, and razors, pianoforte keys, snuff boxes, and various other articles. September 3; six months.

William Freeman, of Millbank-street, stone merchant, for improvements in paving or covering roads and other ways or surfaces, being a communication. September 7; six months.

Thomas Motley, of Bath Villa, Bristol, civil en-

gineer, for improvements in apparatus and means of burning concrete fatty matter. September 7; six months.

William Coltman, of Leicester, framesmith, and Joseph Wall, of the same place, framesmith, for their invention of improvements in machinery employed in framework knitting or stocking fabrics. September 7; six months.

John Whitehouse, the younger, of Birchall-street, Birmingham, brass founder, for improvements in the construction of spring hinges and door springs. September 7; six months.

Samuel Parker, of Piccadilly, manufacturer, for improvements in apparatus for preserving and purifying oils, and in apparatus for burning oils, tallow, and gas. September 10; six months.

Mark Freeman, of Sutton Common, gentleman, for improvements in weighing machines. September 10; six months.

Paul Hanninc, of Clement's Lane, London, solicitor, for improvements in the construction of governors or regulators applicable to steam engines, and to other engines used for obtaining motive power, being a communication. September 10; six months.

Charles Delbruck, of Oxford-street, gentleman, for improvements in apparatus for applying combustible gas to the purposes of heat, being a communication. September 10; six months.

Edward John Dent, of the Strand, chronometer maker, for certain improvements in clocks and other time keepers. September 10; six months.

Henry Houldsworth, of Manchester, cotton spinner, for an improvement in carriages used for the conveyance of passengers on railways, and an improved seat applicable to such carriages and other purposes. September 10; six months.

Hugh Lee Pattinson, of Bensham-grove, Durham, manufacturing chemist, for improvements in the manufacture of white lead. September 10; six months.

George Alexander Gilbert, of Southampton-buildings, gentleman, for certain improvements in machinery, or apparatus for obtaining and applying motive power. September 10; six months.

Robert Goodacre, of Allesthorpe, Leicester, for an apparatus for raising heavy loads in carts, or other receptacles containing the said loads, when it is required that the unloading should take place at any considerable elevation above the ground. September 10; six months.

James Pilbrow, of Tottenham, engineer, for certain improvements in steam-engines. September 10; six months.

William Bedford, of Hinckley, Leicestershire, frame-work knitter, for certain improvements in machinery employed in manufacturing hosiery goods, or what is commonly called frame-work knitting. September 17; six months.

Henry Fourdrinier and Edward Newman Fourdrinier, of Hanley, Stafford, paper makers, for certain improvements in steam-engines for actuating machinery, and in apparatus for propelling ships and other vessels on water. September 17; six months.

Moses Poole, of Lincoln's Inn, Middlesex, gentleman, for improvements in preparing materials to facilitate the teaching of writing, being a communication. September 17; six months.

Walter Richardson, of Regent-street, gentleman, and George Mott Braithwaite, of Manor-street, Chelsea, gentleman, for improvements in tinning metals, being a communication. September 17; six months.

Samuel Draper, of Nottingham, lace manufacturer, for improvements in the manufacture of ornamented twist lace, and looped fabrics. September 21; six months.

William Mill, of Blackfriar's-road, engineer, for certain improvements in propellers, and in steam-engines, and in the method of ascertaining and measuring steam power, parts of which improvements are applicable to other useful purposes. September 21; six months.

Charles Handford, of High Holborn, tea dealer, for an improved edible vegetable preparation called "Eupeci," and the mode of manufacturing the same. September 21; six months.

Thomas Pain, jun., of Upper Seymour Street, Euston Square, student at law, for a plan by means of which carriages may be propelled by atmospheric pressure only, without the assistance of any other power, being an improvement upon the Atmospheric Railway now in use. September 22; six months.

John Maughan, of Connaught Terrace, Edgeware Road, gentleman, for certain improvements in the construction of wheeled carriages. September 24; six months.

George Goodman, of Henley, near Birmingham, needle manufacturer, for certain improvements in the manufacture of mourning and other dress pins. September 24; six months.

Thomas Muir and John Gibson, of Glasgow, silk manufacturers, for improvements in cleaning silk and other fibrous substances. September 24; six months.

William Hirst, of Leeds, clothier, for improvements in the manufacture of woollen cloth and cloth made from wool and other materials. September 24; six months.

Henry Pinkus, of Panton-square, Coventry-street, esquire, for improvements in the method of applying motive power to the impelling of machinery applicable amongst other things to impelling carriages on railways on common roads or ways and through fields, and vessels afloat, and in the methods of constructing the roads or ways on which carriages may be impelled or propelled. September 24; six months.

John Johnston, of Glasgow, gentleman, for a new method (by means of machinery) of ascertaining the velocity of a space passed through by ships, vessels, carriages, and other means of locomotion, part of which is also applicable to the measurement of time. September 24; six months.

Pierre Erard, of Great Marlborough street, for improvements in pianofortes. September 24; six months.

Thomas Robinson Williams, of Cheapside, gentleman, for improvements in the manufacture of woollen fabrics or fabrics of which wools, furs or hairs are the principal components, as well as for the machinery used therein. September 24; six months.

Alexander Dean and Evan Evans, of Birmingham, millwrights, for certain improvements in mills for reducing grain and other substances to a pulverised state and in the apparatus for dressing or bolting pulverised substances. September 24; six months.

LIST OF IRISH PATENTS GRANTED FOR SEPTEMBER, 1840.

Edward Thomas Bambridge, for improvements in obtaining power.

W. Palmer, for improvements in the manufacture of candles and in apparatus for applying light.

Samuel Lawson, for improvements in machinery for spinning, doubling, and twisting, flax, hemp, wool, silk, cotton, and other fibrous substances.

John George Bodmer *(Extension of Term)*, for certain improvements in the machinery for cleaning, carding, drawing, rooving, and spinning of cotton and wool.

Peter Fairbairn, for certain improvements in machinery or apparatus for heckling, combing, preparing or dressing, hemp, flax, and such other textile or fibrous materials.

Charles Wye Williams, for improvements in the means of generating heat, principally applicable to the production of steam and the prevention of smoke.

NOTES AND NOTICES.

Draining of the Lake of Haarlem.—Mr. Fairbairn exhibited last week, at the Glasgow Meeting of the British Association, a model of an engine by which he proposes to effect this great desideratum.

It consists of a scoop, 30 feet square, turning on its centre, which is to be worked by a Cornish engine of from 200 to 300 horses power. In the bottom of this scoop, which was curved, were several valves opening upwards, on the side nearest the engine. By the descending stroke of the engine, this side was immersed in water, and filled through the valves. The returning stroke, or rather the weights attached to the other end of the beam, raised the scoop and threw the water into a canal at a higher level than the lake. Such an engine as Mr. F. proposes would lift 17 tuns of water each stroke, and making seven or eight strokes a minute. The average depth of the lake is ten feet. The engine is so constructed as to give the dipping end of the scoop a larger or shorter stroke as required.

Improved Galvanic Telegraph.—Among the models of mechanical inventions, &c., exhibited at Glasgow, at the last British Association Meeting, there was one of the improved galvanic telegraph, invented by a Mr. Pontin, which is thus described:—The peculiarity of this instrument consists in its requiring only three wires to be stretched between the two stations, by means of which 42 signals are transmitted, and an alarm given, the method of producing which is also believed to be peculiar. This may be first explained. The galvanometer by which the alarm is given, is distinct from those by which the other signals are produced, and is placed in the circuit of one of the wires. It consists of two coils of copper ribbon attached together and placed parallel to each other, with a space between them. Two needles are suspended within the coils, having a platinum wire terminating in a small spiral coil across the direction of the needle. Under the end of the platinum wire is placed a spirit lamp, with a small flame, by means of which the platinum coil is maintained at a white heat. When the needle deviates by means of the galvanic influence transmitted from the other end of the telegraph, it carries round with it the hot platinum coil, which meets a fine cotton thread stretched in its course. This thread is attached to a cord, by which a pendulum is drawn aside from a bell or gong, upon which it tends to fall. The moment that the hot wire touches the thread, it burns it, and the pendulum being freed, strikes the bell or gong, and thus the attention of the person at the telegraph is called to the signal that is made. To prevent mistakes, the signals are returned at such intervals as may be agreed on, either letter by letter, or word by word, the same wires being used to return as to transmit the signal. The wires are brought into connection with the plate of the battery, by dipping the connecting wires attached to the keys into mercury; the galvanic action thus only affects the different needles during the time that any key is kept down.

Naval Architecture.—It is worthy of remark, that the proportions of the *British Queen* steam-ship, the last great effort of marine architecture that has interested the world, are exactly those of Noah's Ark, the first that was set afloat, proving that 4,000 years of practical science has done nothing to improve the dimensions of floating boats, first given by the great Builder of the Universe; and if the critical character on these proportions be duly considered, it may afford an evidence of the truth of the Scripture narrative. The breadth of the Ark was one-sixth of the length, the depth thereof one-tenth of the length. The *British Queen* is 40 ft. 6 in. wide; stem to sternpost 243 ft. aloft, whole depth 29, making the square depth 24 ft. 6 in. The Ark was twice as long as the *Queen.*—*Times.*

The Trafalgar.—This splendid and magnificent vessel, building in Woolwich Dockyard, and to be mounted with 120 guns, is now in a very forward state, being so far finished in the woodwork, as to admit of receiving the priming and first coat of paint on the upper deck. The first deck is also nearly finished, almost all that is required to complete it being the large iron joints for connecting the main beams and sides to each other. The supports of the upper deck have a very chaste appearance, and consist of 33 handsomely turned pillars of the best African oak, equally rich in effect as if they were constructed of the best Spanish mahogany. The second deck is also progressing fast, and the supports of the first deck, a range of similar pillars as those on it, and of the same valuable material, present a beautiful perspective, being placed in one line along the whole length of the ship. She will be launched at the end of the month of February, 1841. —*Times.*

Pottery Printing.—Considerable sensation has been excited among the engravers in the Potteries, by experiments that are now being made by a gentleman from London, in transferring designs and patterns from lithographic prints to earthenware. Apprehensions are entertained that it will supersede engraving altogether; the effect is exceedingly beautiful.

New Chloride of Chrome.—This modification of chromic chloride, insoluble in water, and of the greatest beauty, is obtained by heating strongly a mixture of the oxide of chrome and charcoal in a current of chlorine. There sublimes immediately a body of a scaly or crystaline, lamellar texture, of great splendour and of a magnificent colour. This form of chloride of chrome, undergoes no change by exposure to air. Sulphuric acid does not decompose it; it may be heated when covered with this acid diluted, without change; the dilute acid may be evaporated, and the concentrated acid may be vaporized and distilled without decomposing the chloride. By heating it in the air it is transformed, like the other forms, into the oxide of chrome, with a disengagement of chlorine.—*Annales des Mines.*

Presence of Arsenic in Tin.—The greater number of the tins of commerce contain arsenic. I have found none, except the tin of Banca, and an English tin in lumps,* which are exempt from it. The method of Marsh is perfectly adapted to show its presence. Dissolve from one half to one drachm of tin in concentrated hydrochloric acid, with heat, in a small gas bottle. Hydrogen gas escapes, which will not inflame immediately on account of the vapour of water and acid with which it is mixed. Collect it in a tube filled with water, and furnished with a stop cock, or otherwise connected with a pointed tube. Inflame the gas, and let the burning jet play against a piece of cold porcelain,—the arsenic, if any be present, will be deposited, as it is well known, in the form of a black shining coating.—*M. Wohler. Annales des Mines.*

Method of Discovering the Adulteration of Wax.—The wax of commerce is too often mixed with various substances, and especially with potatoe flour. A simple method of detecting this sophistication is to melt a piece of the wax over a gentle fire, and then to dissolve it in a certain quantity of spirits of turpentine. The wax will entirely dissolve and the impurities be left behind, and by knowing the weight of the wax and ascertaining that of the sediment, the amount of the adulteration can easily be ascertained. The colour given to wax does not, in general, injure its quality, but merely gratifies the eye of the purchaser.—*Journal of the Franklin Institute.*

Deposition of Moisture on Metals.—If we place, in an atmosphere saturated with humidity, a piece of polished zinc and a piece of tarnished lead in contact, when the temperature lowers, the lead becomes covered with dew, and the zinc remains dry without oxydizing. It is thus with two different metals. The moisture settles on one only. If the effect be attributed to electricity we must conclude that the droplets are electrified positively.—*M. Bonsdorf.*—*Annales des Mines.*

Errata.—In the abstracts of patents at page 317 of our last Number, for "James Hadden Young, of *Little France*, merchant, and Adrien *Delcombe*, of same place, &c.," read "J. H. Young, of *Lille* (department du Nord), in France, and Adrien *Dolcambre*, of same place., &c."

* Most probably *Stream* tin.—Trans.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 895.] SATURDAY, OCTOBER 3, 1840. [Price 3d.

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MARSH AND RANWELL'S DESCRIPTION OF A BALLOON.

Fig. 1.

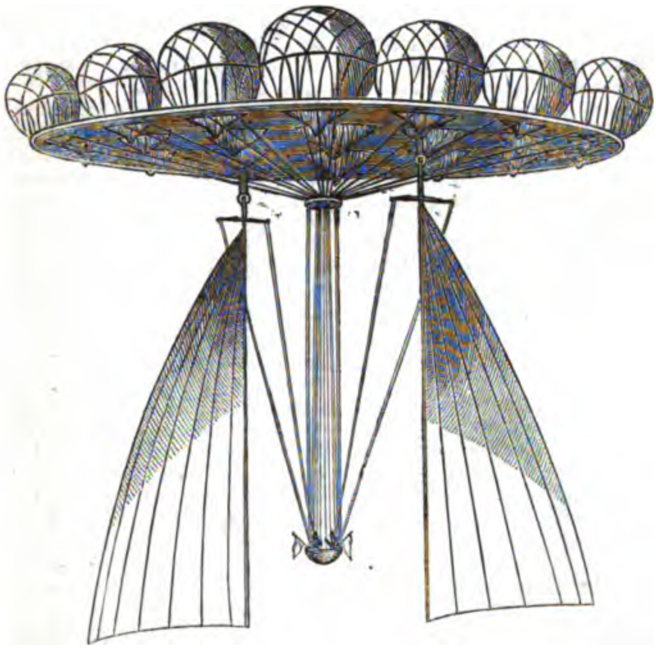
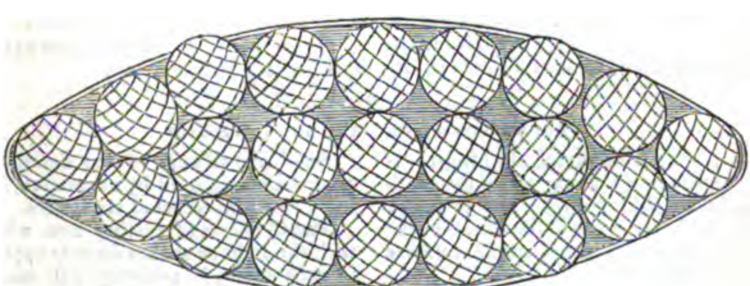


Fig 2.



MARSH AND RANWELL'S PROPOSED METHOD OF AËRIAL NAVIGATION.

Sir,—I lately went to see Mr. Green's mode of propelling a balloon, and was much pleased with the extreme simplicity of the apparatus, and the degree of efficiency obtained by the application. It is, however, confessed that it is only in *still* weather that it is available to propel in a horizontal direction. Although a stride, therefore, is taken in the art, the goal is far from being attained.

Sufficiency of power and suitableness of form, constitute the grand desiderata to render the balloon a vehicle of utility. In the rotary motion of Mr. Green's vanes, there must necessarily be an extravagant expenditure of power on friction. Admirably, therefore, as they are adapted to the purposes of elevation and depression, I fear they will never be available for horizontal progression. The plan I sent you several years ago, of ample valved wings appended to the balloon instead of the car, and worked by a simple method then stated, would, I still apprehend, be productive of a greater gain of power, and a better application of it, than any other mode as yet suggested.

The propriety of attaching the wings to the balloon must be obvious. If the power be connected with the car, a large portion of it must be exhausted in causing it to overtake and get before the balloon, the car being not only suspended by, but in some measure *dragged* as it were by the balloon, all of which power is economized by the connection recommended.

After all, the form would fatalize any attempt to make head way against a directly adverse current, however gentle, from its large opposing surface. If the machine could be propelled and directed a point or two out of the wind's course, it would be a great object attained, but it would still be attended with such a degree of uncertainty in consequence of the lee-way, that no material practical benefit would be the result without further improvement.

I am indebted to my friend Mr. Marsh for a suggestion which goes far to remedy the existing evil. His ideas and my own I have endeavoured to embody in the enclosed sketches, figs. 1 and 2. Let it be premised that a globular form is the only one by any possibility applicable, in consequence of the ascensive property of the gas tending to burst every vessel of fragile material whose shape will not yield to its pressure.

Instead of one large balloon, therefore, we will suppose a number of small ones arranged horizontally, somewhat in the form of a fish or a ship (see fig. 2.)

Let these be attached to a corresponding light metallic frame, to which the car is suspended, and to which the wings are fastened (see fig. 1.)* Each of these globular vessels has a valve, from which a cord passes with the others through a ring into the car, so that the aeronaut may operate with one, or simultaneously with the whole, according to expediency. They may be numbered.

The increase of force thus obtainable by the wings, and the diminution of the opposing surface in the whole machine, would, I have little doubt, enable the aeronaut to go directly against the wind, provided it be not violent; and, at all events, to steer so far out of the wind's course, as to render the art of some practical use.

I will not take up your valuable space at present by details on its application. There are several ways of making and working the wings which I shall be happy to communicate if acceptable.†

Sir, I am, yours respectfully,

Wm. Ranwell.

Woolwich, September 18, 1840.

PROPER FORM FOR CAST IRON WHEELS.

Sir,—While observing the progress of the repairs lately going on in the roadway of Blackfriars-bridge, I was struck with the havoc made in the wheels of the hand-barrows, a considerable number having been broken.

The barrows were of the description commonly employed by excavators, having a cast iron wheel of six spokes.

The ill effects of casting iron wheels with the radii or spokes directly opposed to each other, is perfectly well under-

* The rudder has been accidentally omitted; unfortunately we did not receive Mr. Ranwell's amended drawing, till after the first was engraved.

† We shall be glad to receive a description of them. Ed. M. M.

stood and guarded against in the larger description of wheels, such as fly-wheels and the like, but in the smaller class of wheels the precaution seems to be totally disregarded. It may be argued that from the extreme shortness of the radii there is not an equal degree of contraction and tension; nor is there, but there is still enough to occasion much mischief. I believe it would be found that increased durability would result from giving the wheel one spoke less—that is, by making them with five spokes instead of six; though from the trifling addition to the cost, compared with the great increase of strength and durability, a seven spoke wheel would, I apprehend, prove the best and cheapest.

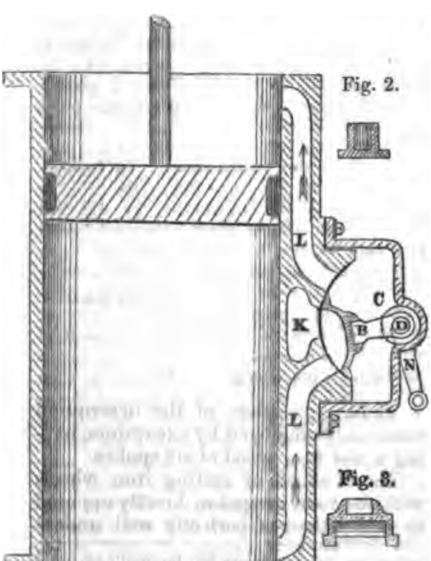
From the great number of these barrows constantly employed by various contractors in different parts of the country, I think this hint may be worth attention, as tending somewhat to abridge "the wear and tear" of this portion of the machinery.

I remain, Sir, yours, respectfully,
Wm. Baddeley.

September 17, 1840.

CONCENTRIC SLIDE-VALVE FOR STEAM ENGINES.

Fig. 1.



Sir,—I now beg to hand you the accompanying drawing and description of a plan for a slide-valve, applicable to stationary, marine, and locomotive steam engines.

Fig. 1 is a section of the cylinder, valve-box and valve, showing the piston during its descent and the valve open for the admission of steam above the piston. C is a lever, made fast to the spindle D, for working the valve: the end of this lever is made to fit easy in the hole in the back of the valve, as shown at B, so as to allow the pressure of the steam to keep it close to the opposite face. The lever N is fastened to the end of the spindle D, which is made to project through the side of the valve-box, and is kept steam-tight by its working in a stuffing box; the other end of the spindle works in a brass bush, similar to the section, fig. 2, which is screwed to the side of the valve-box. This bush and the stuffing-box are each supplied with a small cock, to conduct oil to their insides. Fig. 3 is a transverse section of the valve, which shows the recess for the lever C.

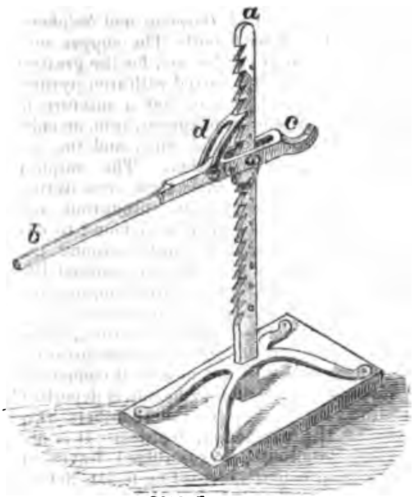
In fig. 1, the steam-pipes L, L, and the exhausting pipe K, are supposed to be cast on the cylinder, but, in large stationary or marine engines, it would perhaps be advisable to make a separate casting for them.

There are no intermediate shafts and levers required to work a circular sliding-valve of this kind; the eccentric-rod may at once be connected to the lever N. In consequence of the circular face of the valve, we are enabled to make the steam and exhausting Passages L, L, K, somewhat broader than those of a common straight sliding-valve, and still have but the same length of stroke given to the lever by the eccentric. Thus: the length of the stroke of a common straight slide valve, is equal to the chord of the arc described by the end of the lever that works the valve. Now, the length of the stroke of the above described circular slide-valve is equal to the arc, described by the end of the lever; so that the difference between the strokes of these two valves is just the difference between the arc and the chord of a segment.

I am, Sir, yours respectfully,
John C. Pearce.

Leeds, September 17, 1840.

IMPROVED CARRIAGE LIFTER.



Sir,—Numerous attempts have frequently been made to improve the old carriage-lifter. A contrivance of this sort used in the City of Brooklyn, U.S., was described by Mr. A. Trevelyan, at page 73 of your 32nd volume; and a still more ingenious contrivance for this purpose was recently rewarded by the Society of Arts.

By far the simplest that I have yet seen, however, is one lately exhibited for sale by Mr. Shaw, Ironmonger, Blackfriars-road, of which the above is a rough sketch. It consists of an upright iron shaft *a*, firmly mounted upon a wooden base, and having a series of ratchets on its inner edge. A cross lever *b c* works upon the upright, and may be fixed at any required height by a pin passing through one of the numerous holes provided for its reception. A pall *d* is permanently jointed to thecross lever, rising and falling with it; when the handle *b* of the lever is depressed, the pall works in the ratchet and prevents its rising again, consequently any weight, such as a carriage axle, &c., is raised and supported upon the crutch *c*, till the pall is released. This is done by slightly depressing the handle and throwing back the pall. Of the simplicity and efficiency of this apparatus it is needless to say more; therefore, I beg to remain, yours, respectfully,

Wm. Baddeley.

September 5, 1840.

GLEANINGS FROM THE PROCEEDINGS OF THE GLASGOW MEETING OF THE BRITISH ASSOCIATION.

(Chiefly from the *Athenæum* Reports.)

Radiant Heat.—Professor Powell called attention to the recent researches of Melloni and Forbes, respecting the *transmission* of heat. The Professor adverted to the discovery of Melloni, that the resistance to the passage of heat is *not* exerted at the surface, but in the interior of the mass. This was a result of the observation, that the difference between the transmission of heat from a more highly heated source and from a less highly heated source became less as the thickness of the screen was diminished, and disappeared when very thin screens were interposed. By comparing the transmissive powers of a great number of substances, he found that in crystallized bodies the diathermancity for the rays of a lamp was proportional to their refractive powers; but in uncrystallized bodies no such law could be traced. It was in the course of these researches that Melloni made the important discovery of the singular property possessed by rock-salt—viz. that it is almost entirely permeable to heat, even from non-luminous sources. He found its transmissive power six or eight times greater than that of an equal thickness of alum, which had nearly the same transparency and refractive power; and that, unlike other diathermanous media, it is *equally* diathermanous to every species of heat—*i. e.* whether from sources highly heated or moderately heated; thus, he found a plate of 7 millimetres (.28 inch) thick to transmit 92 out of 100 rays, whether from flame, red hot iron, water at 212° or at 120° Fah. A plate 1 inch thick gave a similar constant ratio: the general conclusion being, that the source being a lamp, the diathermancy is not proportional to the transparency. In investigating further the properties of the calorific rays immediately transmitted by different bodies, a remarkable effect presented itself: the rays of the lamp were thrown upon screens of different substances in such a manner that, either by changing the distances or by concentration with a mirror or a lens of rock-salt, the effect transmitted from all the sources was of a certain constant amount. This constant radiation was then intercepted by a plate of alum, and it was found that very different proportions of heat were transmitted by the alum in the different cases; from whence he (Melloni) concludes "that the calorific rays issuing from the diaphanous screens are of different qualities, and possess (if we may use the term) the diathermancy peculiar to each of the substances through which they have passed."

He next investigated the effects of *coloured*

glasses, and concludes, that all the coloured glasses except green produce no "elective action" on heat: that green glass, on the contrary, transmits rays more easily stopped than the others. During these researches, Melloni found that a certain kind of green glass coloured by oxide of copper, though it permitted a portion of luminous rays to pass, absorbed all the calorific rays, so that it exhibited no calorific action, capable of being rendered perceptible by the most delicate thermoscope, even when so concentrated by lenses, as to rival the direct rays of the sun in brilliancy.

Influence of the Atmosphere in Intercepting the Heat of the Sun's Rays.—Professor Forbes stated that at Paris the influence of the atmosphere upon rays entering vertically, is to reduce their heating influence by 25 per cent.; that when they enter so obliquely as to form an angle of 25° with the horizon, their heating influence is reduced to one-half; and when at an angle of 5°, to one-twentieth part.

Defect in the Barometer.—A fact was mentioned by Professor Forbes, which seems to lead to the inference that we must repose less confidence in the barometer, as a means of measuring heights, than has been heretofore supposed. It has been found by actually levelling between the Black Sea and the Caspian, that the latter is only 82 feet below the level of the former; whereas barometric measurements, founded on previous determinations, since carefully repeated, gave, in consequence of some as yet unknown anomaly, the difference of 320 feet.

Bleaching Vegetable Wax.—Mr. E. Solly recommends the following method:—The wax is to be melted; a small quantity of sulphuric acid is then to be poured in, composed of one part of oil of vitriol to two of water, and last a few crystals of nitrate of soda are to be stirred in; the whole is to be then agitated with a wooden stirrer and kept heated. Nitric acid is thus evolved in considerable quantity and purity from a large surface, and in such a manner that all the acid evolved must necessarily pass through the melted wax. This method answers the purpose very completely, the process is cheap and rapid, and the residuum, being merely a little solution of sulphate of soda, is easily removed. When it is desired to employ chlorine in place of nitric acid as the bleaching agent, the same process may be adopted.

Purpurate of Ammonia.—Professor Gregory exhibited a new process of preparing this singular compound, communicated to him by Professor Liebig. It is said to be quite certain, and very productive. It consists in adding a boiling solution of 7 grains of aloxan and 4 grains of aloxantine in 240 grains of water to 80 grains of a cold and strong solution of carbonate of ammonia. The mixture instantly acquires a deep purple colour, and, on cooling, deposits the golden green crystals of murexide.

New Compound of Arsenious and Sulphuric Acids.—Dr. Schafhaeutl—The copper ores smelted in South Wales are, for the greatest part, copper pyrites, mixed with iron pyrites, grey copper ore, &c.; in fact, a mixture in which the sulphurets of copper, iron, arsenic, antimony, cobalt, nickel, zinc, and tin, are invariably found together. The sulphur and arsenic escape from these ores during the calcining process, as sulphurous and arsenious acids, and have been found to destroy all vegetation for miles around the copper works, without affecting animal life in the slightest degree. By bringing the escaping fumes, however, in contact with steam, and forcing it through burning charcoal, or subjecting it only to a great pressure in contact with steam, a new solid compound of arsenious and sulphuric acids is deposited on the cool surfaces of the chambers connected with the calcining furnace. It is deposited in beautiful crystallized leaves or tables, and is found, according to Dr. Schafhaeutl, to consist in 100 parts,

of 68.250	Arsenious acid.
27.643	Sulphuric acid.
3.029	Protoxide of Iron.
0.420	Oxide of Copper.
0.656	Oxide of Nickel.
99.998	

Corresponding to	51.741	Metallic Arsenic.
	11.095	Sulphur.
	2.339	Iron.
	0.336	Copper.
	0.516	Nickel.
	33.971	Oxygen.
	99.998	

These crystals attracted moisture from the air with great rapidity and with evolution of heat, corroding animal and vegetable substances as powerfully as concentrated sulphuric acid. Their taste was pure, but powerfully sour, similar to the sulphuric acid, and, dissolved in water, the remainder of 100 parts of these crystals was 17.436 grains only. The shape of the crystals was perfectly retained, only their appearance was changed from transparent into opaque. Their chemical composition was found to be,

16.778	grains of Arsenious acid.
0.656	Oxide of Nickel.
17.434	

What the water had dissolved consisted of

51.472	Arsenious acid.
27.643	Sulphuric acid.
3.029	Protoxide of Iron.
0.420	Oxide of Copper.
82.564	grains.

One of the remarkable changes during the

formation of this compound, was the conversion of sulphurous acid into sulphuric acid, as well as the presence of iron, copper, and nickel in a deposit from gaseous matter. No other definite compound of arsenic acid with another acid seems to be known, except those with the organic tartaric and paratartaric acids.

Upward Falls of Water.—Dr. Robb, in a paper "on the the geology of the country round the river St. John, in New Brunswick," states that the St. John is as large as any of the first class European rivers. It drains a large portion of the province of New Brunswick; and the volume of water which it discharges into the Bay of Fundy is very great, especially during the spring floods. Yet in one place the river is so contracted that it is not more than 310 feet in width. In the Bay of Fundy, as is well known, the tides rise higher than in almost any other part of the globe, there being sometimes, in spring tides, a rise of from 40 to 60 feet. The tidal wave is then forced up into the narrow parts of the river, and causes a backward and upward fall of water, against the natural current of the water, of many feet in height. In the spring, the river is much swollen from the melting of the snow, and between its level in spring and in summer there is a difference of 14 feet.

Preservation of Animal and Vegetable Substances.—The attention of the Zoological and Botanical Committee has been directed to the preservative properties of certain materials when applied separately, either in saturated solutions, or in different degrees of concentration. The experiments have been conducted in glass jars 6 inches by 1½; and saturated solutions of the substances employed having been prepared, were diluted with an equal, and double, quantity of water. One hundred and seventy-eight preparations of animal and vegetable substances were tried. 1. Results obtained with animal substances. Three salts of potassa—the subcarbonate, the bicarbonate, and the arseniate, have afforded the most satisfactory results. The solution of the bicarbonate afforded a flocculent precipitate: the solution half saturated appeared the best adapted. The substances preserving next best are, sulphate of zinc, muriate of magnesia, and arsenious acid. After these may be mentioned sulphate of magnesia, sulphate of potassa, and alumina (common alum), muriate of ammonia, sulphate of potash. Corrosive sublimate is a perfect preservative of animal substances; but this salt renders the substances so very hard, that singly it is unsuited to the purposes of natural history; added in small proportions to other solutions, which render objects too soft, it will probably be found of essential service, as well also in preventing the formation of flocculent matter. One part of naphtha to seven of water produces a favourable result, but when used stronger, the specimens are rendered tough. Acetic and oxalic acid decomposed the skin and cellular membrane of fish, but left the muscles untouched. A few drops of kreosote added to water, preserves the objects, but they become stained dark brown. The following substances are entirely unfit for preservatives: carbonate of ammonia, chloride of potash, muriate of barytes, muriate of lime, nitrate of ammonia, nitrate of strontian, the nitrates of barytes, soda, ammonia, and magnesia, phosphate of soda, the sulphates of soda, potash, iron, copper, and rough pyroligneous acid.—2. Results obtained with vegetable substances. The success here is very slight. None of the salts seem favourable, with the exception, perhaps, of the subcarbonate and bicarbonate of potash. In naphtha and acetic acid, the specimens are preserved, but in the latter they lose their colour, and assume a reddish tinge. Prof. Henslow observed, that, although carbonate of soda of the shops is not mentioned in the report, he finds it to possess considerable preserving powers on animal substances.—Dr. Balfour observed, that he had seen fruits and other parts of vegetables preserved well in a solution of common salt in water. Arsenite of potassa also preserved the colour of flowers well. As a general rule, he believed that salts containing oxygen would not preserve animal substances. — The Rev. Mr. Brodie thought, that the discoloration of some plants might arise from the presence of tannin, or other principles, that acted on the substances in which they were preserved. He had observed oak and elm to become black in the same solutions in which fir and other wood became whiter than ordinary.—Dr. Fleming observed, it was passing from the dead to the living, but he saw there Sir John Dalyell, who was celebrated for preserving alive the lower forms of animals, and perhaps he would give them some account of his experiments.—Sir John Dalyell stated that he had in his possession an actinia, which he had kept alive twelve years, another eight years, a holothuria two years, and other animals of the same class, of varying ages. He found it necessary to change their water every four or five days; when kept longer they become weak and incapable of sustaining themselves with their suckers. The actinia will live a long time without food. They feed on small fish, crustacea, and conchifera. The food of the holothuria he was not certain about. A young skait he kept would eat nothing but whiting.—Dr. G. Walker Arnott thought the preservation of plants had not been sufficiently attended to by the committee. Spirits, he believed, a tolerably good preservative of plants. Sea-water spoiled delicate plants. The lower

forms, as the fungi, &c., were most important, and nothing had been hitherto devised to preserve these in a good state. He had heard of their being kept by immersion in tallow, but had not tried it.

Extinct and expiring Races of Men.—A paper was read, entitled, "Queries respecting the Human Race, to be addressed to Travellers and others, drawn up by a Committee of the British Association for the Advancement of Science, appointed in 1839." At the meeting of the British Association held at Birmingham, Dr. Prichard read a paper "On the Extinction of some Varieties of the Human Race." He pointed out instances in which this extinction had already taken place to a great extent, and showed that many races now existing are likely, at no distant period, to be annihilated. He pointed out the irretrievable loss which science must sustain, if so large a portion of the human race, counting by tribes instead of individuals, is suffered to perish, before many interesting questions of a psychological, physiological, and philological character, as well as many historical facts in relation to them, have been investigated. Whence he argued that science, as well as humanity, is interested in the efforts which are made to rescue them, and to preserve from oblivion many important details connected with them. At the suggestion of the Natural Historical Section, to which Dr. Prichard's paper was read, the Association voted the sum of 5*l*., to be expended in printing a set of queries to be addressed to those who may travel or reside in parts of the globe inhabited by the threatened races. A Committee was likewise appointed by the same Section, to prepare a list of such questions. The paper now presented, and to which the attention of travellers and others was earnestly invited, had, in consequence, been produced. The subjects embraced a wide field of inquiry, and the queries alone filled thirteen closely-printed octavo pages. They referred specially to the stature and weight of the people—any prevailing proportion between different parts of the body—the complexion—the colour and character of the hair and eyes—the formation of the head and face—the skull—and all physical peculiarities—the effect of intermarriage where it prevails—health, longevity, physical and intellectual character—language, &c. &c.

Contagious Fevers.—From the prevalence of fever in Glasgow, it has been supposed to labour under some peculiar disadvantages of situation, or air, or want of cleanliness, which give rise to and favour the diffusion of typhus; but this Dr. J. Perry, in a paper read on the subject, denies, and attributes the greater prevalence of fevers in Ireland and Scotland, than in England, to the greater poverty, mendicancy, and wandering habits of the population. The period observed by the disease in its epidemic returns, he stated to be from ten to fifteen years, during which time it exists in a sporadic form, and in its epidemic about two years. That destitution alone will not produce fever, he thought proved from the condition of the Highlands, for it was stated in the Report of the Highland Relief Fund, that there were 150,000 persons in a state of absolute destitution, and yet he had it on the best authority, that fever was of rare occurrence amongst them, whilst they remained in their own residences, but that when they migrated to large cities, where the disease previously existed, they were immediately seized, and thus swelled the number of victims in the hospitals. From tables elaborately drawn up by Dr. Perry, many important deductions were drawn as to the effects of age, sex, season, &c. in modifying the susceptibility of and mortality from fevers. From these results it appeared, that the number of females attacked by fever under twenty years, is greater than that of the males; that between twenty and forty they are equal, and from forty the male cases predominate. All ages are subject to typhus, unless protected by previously undergoing the disease; but the mortality under ten years is not more than two per cent., while above forty-five it is nearly fifty.

A Moral Revolution Foreseen and Effected—Certainty of Statistical Conclusions.—Dr. Chalmers read a paper "On the Application of Statistics to Moral and Economical Science." Sound philosophy taught us how to distinguish the causal from the casual, and in some degree poured a spirit of prophecy on the mind: on the one hand it led us by analysis to trace back events and phenomena to their ultimate causation; on the other it taught us by synthesis to expect like and proportionate results from similar and analogous causes. Men who were incapable of understanding this process, denounced the results as mere theories. There was not a word more perverted or abused in our language than theory; but in the offensive sense in which it was used by these objectors, it was utterly inapplicable, for the predictions of sound philosophy had all the weight and force of conclusions, tested by actual experiment. The chemist and the mechanician predict, with certainty, the event of an experiment they have tried before; so also may the statist, for he too can possess invariable machines, and invariable materials. After-experience is indeed requisite to accredit his conclusion to mankind, but is not necessary to inspire confidence in his own mind, for that had already been acquired by antecedent experience. The difference between him and those who sneered at him as a theorist was, that he profited by experience which had been thrown away upon them, and instead of

being a speculator, he was in fact the most faithful disciple of observation and experiment. As one instance of the confidence which might be placed in the deduction of general inferences from a thorough consideration of specific facts, he would take the difference between two systems of procedure, which might be designated the aggressive and the congregational. Let there be a proposal made for petitioning parliament on any subject, and one of two courses might be adopted, either the petition might remain for signature at some specified place, or it might be taken by active canvassers from house to house. The success in the one case would be tenfold greater than in the other. It was so in the case of obtaining subscriptions to a charity or purchasers for merchandise; there must be locomotion somewhere, either on the part of the enlister or the enlisted. Experience had decided in favour of the former, its success was accelerated by the force of moral suasion on the conscience, by the imitative tendency of men, by the impulse and communicating force of one energetic mind, exemplifying the action of individuals on masses. He could quote an instance which might be sneered at as professional, but which he trusted would be interesting to all who felt what is now universally recognized, if not with the heart, at least with the tongue,—the importance of national education, and of elevating the moral condition of the working classes. There was a small district near Edinburgh, consisting of a place called the Water of Leith, and two other hamlets, containing 1,350 inhabitants, who had been long and equally distinguished for their poverty and profligacy,—there were not so many as one in nine who attended any place of public worship. The remedy was either to build a church and leave the people to attend it, or not, as they pleased; or, having opened a place of worship, to go round from house to house, into the lanes and the by-ways, and "compel them to come in," by the compulsion of kindly entreaty and affectionate persuasion. The latter course was adopted; the people were not left to seek, but were sought. Those who adopted this plan counted beforehand on a prosperous result; they relied on the strength of a Christian minister to pioneer through a moral wilderness—on the experience of the good effect produced by the pious labours of sincerity in prisons and parishes,—on the susceptibilities of our common nature, which still maintained a lingering existence behind a front of sinning hardihood; on the feelings of survivors when the presence of a Christian pastor shed a halo of sympathy round the dying bed,—they did not calculate on speculations, but acted on experience. The event was present to their minds as a certainty before the fact made it manifest to all mankind. Let a faithful minister take upon him the charge of a limited number of persons in such a state of moral and spiritual destitution; let him be furnished with means to provide a remedy for ignorance, and the vice which results from ignorance; let him be able to give the scholarship of education and religion, and there could be no doubt that in a few months he would witness a moral revolution. Nor would such successes be limited by special localities: religion and virtue thus brought within the doors and to the fire-sides, would obtain the same ascendancy in the filthy lanes and putrid closes of a crowded city, as amid the fragrant flowers and verdant foliage of the village. Human nature was the same in the dark cellars, as it was amid blooming landscapes, and a difference between the urban and the rural population in their moral capabilities, did not exist. The prevalent error on the subject, arose from our associating physical beauty of scenery, with moral loveliness in those by whom it was possessed. The 1350 inhabitants of the Water of Leith, were, as he had stated, of the very lowest rank in society: carriers, quarrymen, and pig-feeders; they were also immersed in the most filthy and degrading immorality. They wallowed in vice. For such people vainly would the heaven-directed spire rise, or the bell issue its summons; the sound would be a voice in the wilderness, wasting its sweetness on the desert air. But, by the introduction of the aggressive principle, an old malt-barn had been rendered not less efficacious than the splendour of a cathedral; and a bell, no way remarkable for melody or power, had obtained as ready obedience to its summons as the sweetest music that ever floated on air. An extra force was introduced, adequate to move and to impel. In the earliest stage, one had gone forth endowed with feelings of brotherhood who kindled the flame of sympathy in their bosoms; his week-day attention generated their Sabbath attention, and proved the aphorism that a house-going minister made a church-going people. The work of two generations was accomplished in as many months. The aggressive system in the malt-barn produced an average congregation of 364, while the attractive system in the neighbouring church only produced 5. Thus, these two forces in moral dynamics—the aggressive and the attractive —were to each other as 73 to 1. He wished that those who had shown hostility to the Statistical Section of the British Association, would consider the value of the single moral principle thus evolved. It was a new law in social science: it was at once an antiseptic, preserving moral health; and a restorative, curing moral degradation. Statistical facts were the *ipsa corpora* of science; the tables of the statists, like the formulæ of the analysts, embodied the past and guided to the future.

Extinguishing Fire in Steam Vessels.—Mr. Wallace proposes to effect this by steam itself. His plan has been some time before the public, and many successful experiments made in the presence of scientific persons. Among the most important was the following, made on board the *Leven* steam-boat:—On the cabin floor, a space of ten feet by fourteen was covered with wet sand, on which was laid iron plates, and on these a fire was kindled with about 4½ cwt. of very combustible materials, such as tar barrels, &c. A hose thirty-four feet long, two and a half inches in diameter, extended from the boiler of the engine to the cabin, and when the fire had been sufficiently kindled, so that the panes of glass in the windows of the cabin began to crack by the heat, the steam was let in, and the doors of the cabin shut. The fire was extinguished in about four minutes. Several trials were made, and all with like success. On another trial, a metal pipe of a greater diameter than the hose was connected with the steam-boiler, and extended into the cabin. A small square hatch was cut in the deck immediately above the cabin, and through this opening were lowered down into the cabin two moveable grates, each containing a blazing fire, well kindled, of about 1 cwt. of coals. The hatch on the deck and cabin doors were then shut, and the steam let in, and in fifteen minutes the small hatch was opened, and one of the grates hoisted up, when the whole mass of coal and cinders, which had before formed a powerful fire, were found to be completely extinguished. This experiment was repeated twice with equal success. In reply to a question from the President, Mr. Wallace said, that the hose might be made either of silk or canvass painted.—It was stated, that in Philadelphia, and now in London, the firemen always direct the water towards the lowest part of the fire, that it might be converted into steam.—Dr. Hamel of St. Petersburg, mentioned, that in Russia they have used woven hemp hose for fire-engines more than forty years.—Mr. Roberts, of Manchester, said, that in that town there had been a fire in a factory some time since, when the men went in, broke the steam-pipes, which were charged, shut the doors, and the fire was out immediately.

Temperature of most Effective Condensation in Steam Vessels.—A paper on this subject by Mr. J. Scott Russell, was read. "Much (says Mr. Russell) has been said regarding the perfection of the vacuum formed in the condenser of a steam-engine, especially a marine engine. It does not appear to be known, that a vacuum may be TOO GOOD. We hear it boasted every day, by rival engineers, that their engines have the best vacuum. Some boast their vacuum at 27 inches, others at 28, others at 29, some at 30, and at last an engineer appears who boasts a vacuum of 30½ inches! It is to be regretted that time and talent should be thus wasted. It is a fact of great importance, and it is the result of theory, established on incontrovertible truth, and confirmed by experiment and by practice, that a vacuum may be too good, and become a loss instead of a gain. The truth is simply this, and should be known to every engineer: *If the barometer stand at 29½ inches, the standard of this country, the vacuum in the condenser is* TOO GOOD *if it raise in the barometer more than* 28 *inches of mercury.* This important truth is incontrovertible—it is practically exhibited every day. The following is a simple proof of this doctrine, divested as far as possible of a technical form, and put in the shape of an inquiry into the best state of a condenser:—

"Let l = the caloric of water of 1°;
c = the constituent caloric of water in the state of steam;
e = the total force of steam in the boiler, in inches of mercury; and,
x = the elastic force of steam at the temperature of best condensation, which we seek to discover.

"Then from the law which connects the elastic force of steam with temperature, it follows, that in case of maximum effect, or the temperature of best condensation,—

$$\frac{l}{c}=\frac{x}{c}, \text{ that is, } x=\frac{el}{c}$$

Now c is 1000; and if the steam in the boiler be at at 5 ℔. above the atmosphere, or if e = 40 inches of mercury, and $l=1$,

$$x=\frac{40}{1000}=0.04$$

Again, if the steam be at 7½ ℔. = 45 inches,

$$x=\frac{45}{1000}=0.045$$

Again, if the steam be at 10 ℔. = 50 inches,

$$x=\frac{50}{1000}=0.05$$

"Hence we find, that the best elasticity or temperature in the condenser depends on the elastic force of the steam in the boiler.

"With steam of 5 lb. in the boiler, the elasticity of maximum effect in the condenser is 93° Fah., and the best vacuum on the barometer is 28.

"With steam of 7½ lb. in the boiler, the elasticity of maximum effect in the condenser is 95°, and the best vacuum on the barometer is 27.8.

"With steam of 10 lb. in the boiler, the elasticity of maximum effect in the condenser is 97°, and the best vacuum on the barometer is 27.6.

"In like manner it would be found, that with steam of 50 lb. in the boiler, worked

expansively, as in Cornwall, the best vacuum in the condenser would be about 26. on the barometer.

"It is hoped, therefore, that the engineers will not in future distress themselves at finding the vacuum of their condenser much less perfect than the vacuum of others who have obtained 30 and 30½ inches at so great loss of fuel and power. To obtain a vacuum of 29½, with the weather glass at 29.75, and steam at 7½ lb., would be to sacrifice four horses' power out of every hundred. In a day when the barometer is as low as 28½ inches, the vacuum in the condenser would indicate 26.8. In speaking of the vacuum in the condenser, it would save much ambiguity to indicate the elasticity merely of the steam in the condenser; thus, if the barometer stand without at 29½, and the barometer of the condenser at 28, it might be stated that the steam in the condenser stands at 1½, being the point of maximum effort. The indication would convey at all times more precise information."—Mr. Fairbairn wished to know whether the facts stated by Mr. Russell had been practically established.—Mr. Russell stated how the experiment might be made.—Mr. Fairbairn considered this a very important subject, as bearing on the economy of fuel, and regretted that Mr. Russell had not given an account of his experiments.—Mr. Russell suggested that Mr. Fairbairn should himself undertake the experiments.—Mr. Hodgkinson considered it very important that experiments should be carried on; and Mr. Fairbairn, that experiments should be made on steam at all pressures. It was suggested that this was a proper subject to be inquired into by the British Association, and it was agreed that the Committee of the Section should discuss the propriety of applying for a grant to pursue the experiments.

Wheels of Locomotive Engines.—A paper by Mr. Grime on this subject, and containing a description of a wheel of a new construction was read. The rim or felloe of the wheel is turned, welded, and blocked in the usual way to the size required, say three feet diameter; the side, or front rim of the wheel, is formed out of boiler plate-iron, say five-eighths of an inch thick, clipped round to the size required. "I then," says Mr. G., "take the plates and punch out the centre, which forms the eye of the wheel. After this, the shapes are punched out, leaving the boss and arms standing together, with a sufficient breadth of iron at the extremity of the arms that will be equal to thickness of felloe, say one inch and a half or two inches, for wear, and, when welded, forms part of the felloe. The boss of the wheel is punched out of plate-iron, say one quarter of an inch thick, into what I denominate washers; I then pile them one upon another, to the breadth of the wheel, taking notice to cross the grain of the iron every washer when piling them. By so doing, the boss, or nave, will be considerably stronger and tougher than if the grain of iron went all one way. When this is done, it bears the name of 'faggotted iron.' The washers being piled to the required thickness, I pin them to one of the punched plates, the diameter of wheel required; then put the rim or felloe on, and pin it to the plate. This being done, I put in the midfeather, say half an inch thick, and the depth of felloe and piled plates or boss, there being in every washer a half circle punched out to receive the midfeather; the other plate is then put on, and pinned to the other parts. The wheel being now formed, it is taken to the furnace, which is constructed with a revolving table at the bottom, so arranged that it can be dropped or raised. This table is formed of fire brick, and on the top are placed five loose bricks, to keep the wheel from touching the table, and to enable the workmen to get the wheel into the furnace and out again by means of a fork. The furnace having been got up to an intense heat, the table is set to a particular mark, the door of the furnace is raised, and the wheel slided on to the table; the door is then closed, and the table, which is worked from underneath by a tooth and pinion, is turned round, presenting every part of the wheel regularly to the flame, as the flame rushes through the furnace. The wheel, having been in about three-quarters of an hour, and having arrived at a perfect welding heat, the table is turned to the mark before mentioned, and the wheel is slided out on to an anvil. This anvil is planed perfectly true on the face, and is larger in diameter than the wheel. Above the anvil is the hammer, of about fifteen hundred weight, suspended at a height of about twelve feet, the face of this hammer being planed perfectly true, to correspond with the face of the anvil. As soon as the wheel is placed on the anvil, the hammer is released, falls on the wheel, and perfectly welds it into one entire solid at a single blow. Before pinning the wheel together, I put the various parts into a solution of vitriol and water, and, should there be any part corroded, it immediately removes it, so that there is nothing but pure iron, and a good welding is easily obtained. The wheel, when cold, is turned up in the usual way."

Timber Bridges for Railways.—Mr. Vignoles stated that he had, by permission of the Committee, selected this subject for illustration and discussion before the Mechanical Section, from the notes of a work he was preparing for publication, "On the General Principles and Economy of Railways," his object in so doing being to elicit the opinions of his brother engineers, and to invite discussion and obtain information, but especially

to direct the attention of all parties interested in the extension of the railway system to a principle of construction which, in many cases, would be found of great advantage in the economy and facility presented for overcoming obstacles, otherwise insurmountable, within reasonable limits of expense. Mr. Vignoles took a rapid view of the history of timber bridges, tracing their first erection in Germany, then through the United States of America, and back to Great Britain. He also described the difference between the principles of large bridges constructed with baulks and half-baulks, and of timber arches, formed of layers of plank laid over each other, and fastened securely together, and, with felt beneath, to make the joints and beds wholly impervious to water. Mr. Vignoles stated, that the first bridge on this principle in Great Britain had been erected at some place in Scotland, by an ingenious mechanic of that country, whose name he regretted not to be able to state. This was many years since. The principle had been also made known, particularly of late years, by the timber viaducts erected under the direction of Messrs. Green and Son, of Newcastle-on-Tyne, who had built several, and had designed more; and Mr. Vignoles further explained, that Mr. Nicholas Wood, of Killingworth, was at this time erecting, for the Duke of Buccleugh, a timber viaduct, of great height, and with large openings. Mr. Vignoles disclaimed any intention of discussing the question as to whom the merit of originality belonged, and observed, that he, at present, purposely refrained from any details, as these had been entered into by Mr. Green both at Newcastle and at Birmingham, reserving any remarks on such details for a future occasion, should it present itself. Mr. Vignoles then explained the peculiar applicability of timber bridges or viaducts to the passage of deep ravines, so often met with in hilly and mountainous districts, illustrating his remarks by diagrams. The communications, for example, to be made between the north of England and Scotland would probably have to be sought along some of the valleys leading to the passes through the Cumberland Hills, and here, as in many similar districts, engineers in the habit of considering such lines well knew, that many miles of favourable country for roads or railways were often to be obtained along the sides of such principal valleys, until some unavoidable and appalling obstacle appeared in the passage across some of the lateral openings or ravines. Instances had and might occur where the whole of such a line, otherwise highly desirable, would have to be abandoned, unless some economical construction were devised to surmount the difficulty: and here the timber viaduct would most advantageously be introduced, since many feet additional height in the level of the railway would add but little to the expense. Mr. W. then instanced several places of formidable height, and of various breadths, where he had already designed, or knew of the applicability of such constructions. In reference to the expense, he stated, that it was chiefly when extraordinary height and either one arch of great span were required, or where a series of arches, of large openings, were wanted or could be introduced, that the timber viaducts were the most economical. In ordinary heights of 50 or 60 feet, and with arches of less span than 100 feet, and particularly in countries presenting facilities for constructions of stone, these latter would be undoubtedly preferable; but when the height of the construction became great, the great expence for the centering for arches of masonry, and the multiplication of the number of piers, in order to keep the span of the arches to a moderate size, greatly increased the expense, and threw the balance vastly in favour of the timber. Mr. Vignoles instanced the Ribble Viaduct on the North Union Railway, which is about 50 feet high, with five large arches, of 120 feet span, and had cost 60*l.* per lineal foot; whereas, in another place, a timber viaduct, of 140 feet high in the centre, and averaging 100 feet high, with arches of 130 feet span, and extending for a length of nearly 2000 feet, was proposed, which would not exceed in price 20*l.* per lineal foot, the breadth of roadway being, in both cases, 28 feet for a double line of rails. Mr. Vignoles stated, that in extending lines of railway through the west of England to the packet stations, through the mountains of Wales for a communication between London and Dublin, and through many parts of Ireland, along the lines laid out by him for the Government Railway Commissioners, the timber viaducts would, from their cheapness, enable the works to be entered upon, which the great cost of stone would quite forbid; and he concluded by calling on his fellow engineers to turn their attention to this while laying out new lines, and to take bolder steps across the valleys, relying on the timber viaducts to accomplish their objects.

Mr. Blyth thought that Mr. Vignoles had over-estimated the expense of stone, which Mr. Blyth knew had been executed at about 25*l.* per foot.—Mr. Vignoles replied, that it was seldom that stone could be had at so small an expense; when the span is large, and the height great, is much more costly.—Mr. Smith, of Deanston, agreed with Mr. Vignoles, but did not think that planking was the best method, as it would not stand so long. A wooden bridge should be so constructed, that any decayed part could be taken out and replaced.

(To be continued.)

THE "ARCHIMEDES" STEAMER.

Sir,—As during my absence from Great Britain in the *Archimedes* you were induced to insert an article in your publication by some *anonymous* correspondent, which is at direct *variance with the truth*, I feel assured that, upon the principle of "*Audi alteram partem*," you will most readily give insertion to the enclosed communication, made to the *Liverpool Mercury* by my friend Captain Chappell, R.N., in the *correctness* of which I entirely concur.

I remain, Sir, yours obediently,

F. P. Smith, Patentee.

15, Fish-street Hill, 23d Sept. 1840.

To the Editor of the *Liverpool Mercury*.

Sir,—I have just read in your paper of Friday last, a statement as to a trial of strength between the *Archimedes*, screw-propeller ship, and the *William Gunston*, paddle-wheel steamer, together with certain deductions drawn from such data by the writers who inserted the account in question in the *Mechanics' Magazine*, from which it was copied into the *Nautical Magazine*. Mr. Smith having been absent from the kingdom when this monstrous falsehood made its appearance, the story remained unanswered, otherwise than by an article in the *Sun* newspaper, of which the following is an extract:

"Another article in the *Mechanics' Magazine* of Saturday, the 25th ultimo (evidently written by some person altogether unacquainted with the subject), states that Messrs. Fawcett and Barnes had been trying the relative power of 'paddle-wheels *versus* screws,' and that a tug-boat, called the *William Gunston*, had pulled the *Archimedes*, stern foremost, at the rate of eight or nine knots, the power of the former vessel being 40 horses, and the latter 50 horses. *Every word of their statement is untrue!* Mr. Fawcett was never on board the *Archimedes* as described. The power of both vessels is stated at less than half what it is in reality; and that of the *Gunston* is imputed to the *Archimedes*, while the smaller power of the *Archimedes* is given to the *Gunston*. The greater-powered vessel did certainly drag the smaller; but the difference was extremely trifling; and a report of the whole of these interesting experiments, which are stated to have been highly in favour of 'screws *versus* paddle-wheels,' will probably be communicated to the public before long, by the scientific gentlemen at whose request and under whose able superintendence the whole were instituted."

It was supposed, Sir, that the foregoing contradiction would have put to rest the malicious paragraph published in the *Mechanics' Magazine*; but, as the *Nautical Magazine* has copied the same false statement, and, in commenting upon it, founded a condemnation of Mr. Smith's propeller upon such miserable misrepresentation, thereby misleading so able, so candid, and so respectable a publication as the *Liverpool Mercury*, I think it but an act of common justice to request your insertion of this letter in your paper; and I subjoin the copy of a communication made to me by Mr. Claxton, managing director of the Great Western Steamship Company, who, with Mr. Brunel, their engineer, superintended the experiments of which the *Mechanics'* and *Nautical Magazines* have given accounts so directly at variance with the truth:—

"Great Western Steam-ship Office,
35, Prince's-street, Bristol,
August 11th, 1840.

"My dear Chappell,—I have been much vexed at observing a letter in the *Mechanics' Magazine* of July 25, under an anonymous signature, reflecting on Smith's screw, during some experiments which the directors of the Propeller Company liberally allowed Mr. Brunel and myself to make three weeks ago. Almost immediately after our return, Mr. Brunel made the calculations of comparative power between the *Archimedes* and the *William Gunston*, and I sent a rough copy of them to my son, for Smith, immediately before they started for Oporto. Mr Brunel is not here, and I have no copy; but feeling that the *Gunston* was hired at our joint request, I hasten to state, from memory, that the *Gunston's* power proved considerably superior to that of the *Archimedes*. The former worked at a pressure of ten pounds to the latter's five pounds upon the inch. Looking at the amount of the area of the floats, the number of revolutions of the *Gunston's* engines, and the area of the midship sections of both vessels, together with the different objects for which they were built, the trial was anything but a fair one on the *Archimedes*. The *Gunston* had, as she ought to have had, the best of it; but it was for some time a matter of doubt; and if the trial had continued an hour, it is my belief a quarter of a mile would have been more than the *Archimedes* would have been towed astern.

Setting aside the positive misstatements, there is so bad a spirit manifested in the article in question, that I flatly deny the assertion that the *Archimedes* towed the *William Gunston* at all, or that any one named Fawcett was on board. The object of our experiments was a very different one than a mere "trial of strength" between two steam-vessels, which, in fact, only occupied ten minutes of a long day, that we were intensely occupied.

"The *Gunston* managed to tow the *Archimedes* when the latter's engines were stopped and the screw-propeller thrown out of gear,

so as to revolve with the vessel's way, at the rate of about seven knots; but the anonymous writer makes the *Gunston* run away with the *Archimedes*, at the rate of nine knots, *against all the efforts of the screw!!* Can anything be more absurd? I will, if you wish, obtain and send the calculations.

"I congratulate Mr. Smith on the sixty-nine hours' passage to Oporto, and I am rejoiced to find there has been some sea in the Bay of Biscay, as I trust it has enabled my son to obtain all the data that Mr. Brunel requires.

"Yours, very truly,
"CHRISTOPHER CLAXTON.

"To Captain Chappell, R.N."

From the generous manner in which you defended Mr. Smith's surprising invention, even under belief of the statements in the *Mechanics' and Nautical Magazines* being correct, I am confident you will rejoice, as I do, at the discomforture his *anonymous* enemy will receive from the contents of Mr. Claxton's letter; and sincerely thanking you upon behalf of Mr. Smith for your advocacy of the truth, the whole truth, and nothing but the truth,

I remain, Sir, yours, &c.,
EDWARD CHAPPELL, Capt. Royal Navy,
Formerly Agent to H. M. Packets
at Liverpool.

To the Editor of the Liverpool Mercury.

[We see nothing either in the letter of Captain Chappell, or in that of Mr. Claxton, or in that of Mr. Smith, to justify the offensively strong terms in which they are conceived. The statement which we published of the trial in question came to us from a party quite as much entitled to credit, in our estimation, as any one of these three gentlemen; and though they have shown themselves very angry with it, they have yet to show, by something better than mere general contradiction, that it is to any extent worth mention, substantially untrue. Whether Mr. Fawcett was present or not, can hardly, we imagine, affect the result of the trial one way or the other; and assuming our informant to have made a mistake on this head, it is one of which he may well afford to make his revilers a present. The "truth, the whole truth, and nothing but the truth," is what these gentlemen profess to have much at heart; but can any one tell from their letter what is, after all, the real truth as to the trial in question? To us they seem to have left the matter, in all but foul words, just where they found it. Now surely when one person gives another the lie in such broad terms as is done in the present instance, he ought in common decency to be prepared to show specifically in what the lie consists. It is not, besides, we apprehend, usual with men of honour and lovers of truth to give any one the lie behind his back, or through any such circuitous channel that it may never happen to come to his knowledge; but Captain Chappell's charge of "monstrous falsehood," instead of being made through the medium of the *Mechanics' Magazine*, where it would have at once met the eyes of the correspondent affected by it, was addressed to the *Liverpool Mercury* about six weeks ago, where the chances were ten to one against his ever seeing it, and of its appearance in which he might, but for Mr. Smith's present resuscitation of the thing, have remained for ever ignorant! Let Capt. Chappell defend this course of proceeding as he best may, we suspect he will in the end have but small occasion to thank his friend Mr. Smith for giving our correspondent an opportunity (of which we hope he will make speedy use) of defending himself against this unnecessary attack. ED. M. M.

WHITELAW AND STIRRAT'S PATENT WATER WHEEL.

The *Greenock Advertiser*, after extracting from the *Paisley Advertiser*, the account quoted in our last number of the late successful experiment made with this wheel at the Shaws Water Works, observes:—"We have little to add to what our contemporary has stated in regard to the Patent Water Wheel. Perhaps the advantages of this machine, arising from its little liability to tear and wear, might be brought more prominently into view. In point of fact, it is not likely, barring accidents, to require repair for half a century. We may also mention its applicability to small runs of water falling from a great height, and for which the common wheels are useless. For example, on a small rill discharging 40 or 50 cubic feet of water per minute from a height of 1000 feet—and there are many such in the Highlands—the Patent Mill might be erected at a small expense, and worked up to upwards of 100 horses' power. When the number of these mountain streams is considered, the amount of power which, by means of this machine, might be made available, is incalculable. We shall just advert to one other point, but it is one of no small importance. By the self-acting governor attached to the wheel, the speed is kept at all times uniform and regular, although any part of the machinery which it may be driving should be suddenly stopped. These are very important advantages, and we shall conclude by reiterating what we said by all who were present at the trial on Wednesday last, that the invention of Messrs Whitelaw and Stirrat of Paisley, will ere long effect a complete revolution in the mode of applying water power."

THE "NEW THEORY OF THE UNIVERSE."—
(SEE VOL. XXXII. PAGE 555.)

Sir,—At a time when the lives of our fellow creatures are so much endangered by the inaccuracy of our information respecting the nature of motion, I cannot help pressing on the notice of the public the importance of my new Theory of the Universe. It is impossible to account for motion on any other principle in a satisfactory manner. For instance, has the immense elevating force produced by rotary motion been taken into account in the construction of a railway conveyance? I am no mechanic, but in accordance with my theory, many things appear to me in a different light to that in which they are viewed by others; and, on inquiry, I find these many things are not well understood by any one. I have been told that I have crammed into one little page of your excellent work enough matter to fill a publication consisting of three volumes. If this is a fault, it certainly is not a fashionable one. I shall be very happy to answer any questions which my too great conciseness may have rendered necessary.

I remain, Sir,
Your obedient servant,
E. A. M.

September 23, 1840.

RECENT AMERICAN PATENTS.

[Selections from Dr. Jones's List in the Journal of the Franklin Institute, for June, 1840.]

AN IMPROVED GUN, *Nathan Starr, May* 3, 1839. This gun is of the kind that have a single moveable chamber which is raised on a pivot at its rear end to receive the charge, and is then forced down in a line with the barrel, and caused, by an eccentric, to enter the rear end of the barrel to a small distance, a fillet being formed on it for that purpose. The claims made are to the particular arrangement of the parts for effecting this purpose, and there is also a claim to the using the ram-rod as a bayonet, one end of it being made pointed with that view, and provision being made for fixing it to the gun.

The parts described and claimed as new do not present anything worthy of particular notice as being superior to others previously made for the same purpose.

MACHINE FOR RAISING CANAL BOATS FOR REPAIR, *Penrose and Palmer, May* 11, 1839. "The nature of our invention," say the patentees, "consists in raising a boat in a swinging position, by means of levers or balance beams, connected to frames which may be easily changed from one position to another, which is frequently necessary to work under the bottom of a vessel." The boat is to be raised by means of levers, to the short arms of which are attached frames of sufficient size to surround the boat, and these are to be let down into the water, so that the boat may enter them. To the long ends of the levers a box or trunk is attached, into which water may be poured, so as to raise and balance the boat. The levers are sustained on stout stone posts, which have their fulcra placed upon them.

The claims are to "the mode of raising and suspending boats for repair by vibrating lever frames, combined with longitudinal and transverse frames attached to the ends thereof; one set of transverse frames at the short ends of the lever frames containing the vessel to be raised, another set of transverse frames at the long ends of the lever frames suspending a trunk of water for balancing the boat."

IMPROVEMENT IN STEAM BOILER FURNACES, *Maillard, May* 18, 1839. This improvement, it is said, "will give an economy of more than one-third of the consumption of fuel, by the combustion of *dead steam.*" A gift, certainly, of no small importance. By *dead steam*, is meant that which has performed its office in the cylinder, and this is conducted through suitable tubes into hollow grate bars, under the furnaces of high pressure boilers, whether of locomotive or other steam-engines. From the hollow bars the steam is to enter the fire through numerous holes in them, made for that purpose.

Claim.—"I do not claim as my invention the introduction of waste steam into, or amidst, the red-hot incandescent coals in the furnace for the purpose of increasing combustion by its decomposition, this having been previously done, but not in the manner in which I effect it. I therefore claim as my invention, and desire to secure by letters patent, the introduction of waste steam on, or amidst, the red-hot incandescent coals, by means of the arrangement of conical tubes, and hollow perforated bars, on which the coals rest, in the manner described."

There are several grave questions connected with the invention that is the subject of this patent, which we have not time to discuss, but which we will not entirely dismiss. To the theory that the water is decomposed, and aids the combustion in consequence of this decomposition, we have not yet, and do not now, give our assent; but this is a matter of no importance practically, provided the combustion be actually rendered more efficient by its agency, which we do not dispute. Steam and water have been carried into hollow perforated bars with the same view as that above declared, but, so far as we are informed, the plan has been universally abandoned. The bars must, necessarily, when in contact with the fire, be frequently out of order. In locomotive engines the waste steam is wanted to increase the draught in the chimney, and if diverted from this object,

and applied elsewhere, a balance of accounts will have to be struck, and this, we apprehend, would be against the sending the waste steam into hollow bars, so far as locomotives are concerned.

IMPROVEMENTS IN RAILWAY CARS, *Germain, May* 7, 1839. The patentee has represented a six-wheeled car, having a separate frame for each pair of wheels, and these frames operating upon each other, by means of a toothed segment and rack, or by means of jointed cross bars, on the middles of their sides of contact, these devices being substantially the same with others heretofore adopted. The middle frame of the three which sustains the axles, is so connected with the general car body frame above them, as to allow a certain degree of vertical play to it, for the purpose of equalizing the bearing of the wheels on the rails: this is effected by means of what are called stands and slides. The wheels are thus to adapt themselves to the curvatures of the road, and to its horizontal deviations. The claims are to the stands and slides in combination with the middle, and top, or body frame, in the manner described; and to the manner of connecting the three axle frames together, by a single or double cross joint, or a rack and segment wheel.

The actual novelty of the devices here patented is but small, and we do not see anything in them to justify high anticipations of their utility.

IMPROVED JACK SCREW, *Vail, May* 7, 1839. This jack screw is intended principally for the purpose of lifting locomotives and cars on to the track of a railroad, and to this purpose it appears to be peculiarly well adapted; and it is, of course, also adapted to the raising of heavy bodies of other kinds.

The main lifting screw works through a nut, the standard, or lower part of which is bifurcated, or divided into two legs, which rest upon a suitable base, to which they are hinged, so as to admit of the head of the main screw being thrown over, its shaft standing out of the perpendicular. The head of this screw has a collar round it within which it can turn, and to this collar is hinged the head of a second screw, which stands at an angle of about 45° with the first, and, like it, has a nut with bifurcated legs, hinged to the same base with the former. The two screws and base constitute a right-angled triangle when the main screw stands in a vertical position. It will be evident that by the action of these screws a heavy body may be raised, and moved over laterally, as may be required. The claim is to "the combining together the two screws in the manner above set forth, that is to say, by giving to their standards a hinge motion on the platform or base of the apparatus, and by connecting them to each other at their upper ends by a joint, whilst they are allowed to turn freely by the arrangement of the collars and swivels, or by some analogous contrivance; by which arrangement the locomotive, or other heavy body, to be raised, may be first lifted vertically, and then moved laterally, for the purpose, and substantially in the manner, set forth."

IMPROVED PRESS, *Wise, May* 16, 1839. There appears to be considerable novelty in this press, but we are very apprehensive that its merit will consist more in this than in its special adaptation to the purpose of pressing. Its operation is like that of the screw press, but it is without a screw, the office performed by the thread and nut in that power being effected by inclined planes, formed on the transverse sections of a divided shaft.

There are two followers, which are connected to the cheeks of the press by palls or catches, said cheeks being notched for that purpose. The lower follower is to press the goods, and between the two is a vertical cylindrical shaft, divided transversely, and having its upper portion fastened to the upper follower, whilst the lower portion, which is pointed, or formed conically at its lower end, bears on the lower follower. The section of the shaft is divided into three equal inclined planes, having vertical off-sets at their terminations; and when the lower portion of the shaft is turned, by means of a lever, one-third of a circle, the lower follower will be forced down to a distance equal to that of the obliquity of the planes, and the palls will catch upon the cheeks; when the planes are so turned that their vertical off-sets coincide, the upper follower will then fall, and its palls engage with the cheeks, when the operation is to be repeated. Friction rollers or balls, it is said, may be interposed between the inclined planes.

IMPROVED BALANCE LOCK FOR CANALS, *White, May* 17, 1839. The construction of this balance lock is, in general, similar to such as are described in the books, but it contains some improvements which appear likely to render it more stable and efficient than those heretofore essayed. The points claimed are the following:—

1st. "The employment of drums without gudgeons, and sustained on friction wheels or rollers, as a substitute for the shafts and wheels, or pulleys, heretofore employed over the chambers of balance locks.

2nd. "The manner of employing bands of rolled iron or steel, instead of chains, by which to suspend the caissons or boxes, as described.

3rd. "The attaching the ends of the double bands of iron or steel to a vibrating lever, for the purpose of giving an equal tension to such bands.

4th. "The hanging the pool gates in

movable frames, sliding in grooves, and adjusted by screws, for the purpose of adapting the said gates to the varying height of the water in the respective levels, as described."

LIST OF PATENTS GRANTED FOR SCOTLAND SUBSEQUENT TO THE 22ND AUGUST, 1840.

George Saunders, Hooknorton, Oxford, clerk, and James Wilmot, of the same place, farmer, for improvements in machinery for dibbling, or setting wheat and other grain. Sealed, August 25, 1840.

Charles Wye Williams, of Liverpool, Lancaster, gentleman, for improvements in the means of generating heat, principally applicable to the production of steam and the prevention of smoke. August 28.

Thomas Gadd Matthews, of Bristol, merchant, and Robert Leonard, of the same place, merchant, for certain improvements in the machinery or apparatus for sawing, rasping, or dividing woods, or tanner's bark. August 31.

Miles Berry, of 66, Chancery Lane, Middlesex, being a communication from abroad, for certain improvements in the strengthening and preserving ligneous and vegetable substances. September 1.

Peter Fairbairn, of Leeds, York, engineer, being a communication from abroad, for certain improvements in machinery or apparatus for heckling, combing, preparing, or dressing hemp, flax, and other textile or fibrous materials. September 7.

Thomas Milner, of Liverpool, Lancaster, for certain improvements in boxes, safes, or other depositories for the protection of papers or other materials from fire. September 8.

John Johnston, of Glasgow, Lanark, North Britain, gentleman, for a new method (by means of machinery) of ascertaining the velocity of, or the space passed through, by ships, vessels, carriages, and other means of locomotion, part of which is also applicable to the measurement of time. September 14.

Edwin Travis, of Shaw Mills, near Oldham, Lancaster, cotton spinner, for certain improvements in the machinery or apparatus for preparing cotton and other fibrous materials. September 15.

Henry Curzon, of Kidderminster, Worcester, machinist, for improvements in steam-engines. September 16.

George Gwynne, of Portland-terrace, Regent's-park, Middlesex, gentleman, for improvements in the manufacture of candles, and operating upon oils and fats. September 16.

Henry Waterton, of Fulmer-place, Gerard's-cross, Buckingham, Esq., for certain improvements in the manufacture of sal ammoniac. Sept. 16.

John Gibson and Thomas Muir, both of Glasgow, Scotland, silk manufacturers, for improvements in cleaning silk and other fibrous substances. September 17.

James Surling, of Dundee, engineer, and Robert Surling, clerk, D. D., of Galston, Ayrshire, for certain improvements in air engines. September 17.

James Harvey, of Bazing Place, Waterloo Road, Surrey, gentleman, for improvements in extracting sulphur from pyrites, and other substances containing the same. September 21.

Gerard Ralston, of Tokenhouse Yard, London, merchant, being a communication from abroad, for improvements in rolling puddle balls, and other masses of iron. September 22.

NOTES AND NOTICES.

Action of Ammoniacal Salts on Glass.—Mixtures of hydrochlorate and nitrate of ammonia attack glass very strongly, especially when it contains lead. When sulphate of ammonia is heated in a glass vessel, it begins to melt at 140°, and from that to 280° it undergoes no alteration; but at this temperature ammonia is disengaged; sulphate and sulphite of ammonia sublime, and we soon remark that the glass is strongly attacked; the interior surface becomes dull, from a combination of sulphuric acid with the potash. The glass often cracks and sulphate of potash issues through the crevices.—*M. Marchand, Annales des Mines.*

Granite Roads.—I have long thought the repairing of granite roads is very carelessly done. The road is picked up and a quantity of loose granite thrown carelessly over it, which gets fixed according to chance—being in many places too high, especially next the water channel, and in many too low. I am persuaded, if the roads were well watered, and smaller quantities were thrown over it, and well rammed down with iron-headed rammers, there would be a great saving in granite, and every bit would find its proper resting place, and no annoyance be occasioned to passing horses and carriages.—J. B.

Fires in Glasgow.—The number of fires in the city and suburbs, from 1st of January 1836, to 31st of January 1839, being three years, was 268. Of these, in 19 instances, the premises were totally destroyed; in 64 considerably damaged; and in 185 slightly damaged. In 239 instances the causes were ascertained, and were very varied; in 31, the causes were not ascertained; and in 5, the fires were considered wilful, the parties having been taken into custody, and the cases reported to Crown counsel. The most frequent cause was found to be from flues and stoves taking fire through carelessness.—*Captain Millar's Report to the British Association.*

The War Steamer Nemesis at the Cape.—Papers from Cape Town, July 7, announce the arrival of the first iron steam-boat that has doubled the Cape of Good Hope—the war-steamer *Nemesis*. It was built by Mr. John Laird; who, we are reminded by the Cape paper, has built thirty iron vessels, which are at work in different parts of the world—"on the Nile, the Savannah and Mobile rivers, on the Indus, the Niger, and the Vistula." A paper from the colony also supplies us with the following account of the ship—"This splendid iron vessel, W. H. Hall, Commander, R. N., from Liverpool, last from Prince's Island and the Bights, and now in Table Bay, is the largest of her class ever built in England, and does great credit to her scientific builder, John Laird, Esq., Birkenhead, Liverpool. Her dimensions are, 168 feet long, 29 feet beam, and 650 tons burden, and fitted with two medium pivot-guns, 32 pounders, one forward the other aft, and six swivels. The engines are 120 horse-power, of superior make, in good order, and are highly creditable to Messrs. Forester and Co., of Liverpool; and she is, we hesitate not to say, one of the finest steamers that ever came into this bay, and certainly the first iron one. On the 19th June, in lat. 31 S., long. 8 10 E., she experienced a North-west gale, with the usual high Cape sea; she was extremely easy, never shipping any water, and going nine and ten knots, under canvass alone, the floats having been taken off. Last Friday, his Excellency the Governor and suite having gone on board, she slipped from her anchorage and steamed round the Bay, trying the different range of her guns. At two o'clock p. m., her Commander brought her alongside the jetty, (and we must not forget to mention that here she was first also,) and landed the Governor and suite with three hearty and British cheers. During her stay she was crowded with visitors, for the extreme novelty of the circumstance excited the curiosity of all classes from the shore. Having taken on board, in three hours, 100 tons of coal, and completed water, although no preparations had been made, she returned to her anchorage in the bay."

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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DIRCK'S RAILWAY WHEEL WITH WOOD TYRE.

Fig. 3.

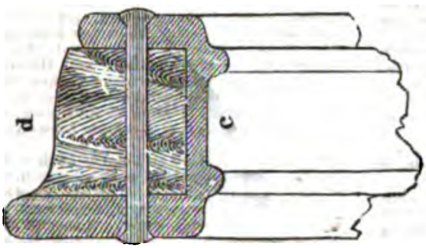


Fig. 4.

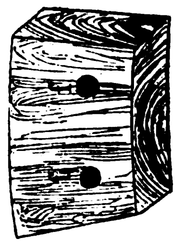


Fig. 5.

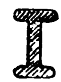


Fig. 2.

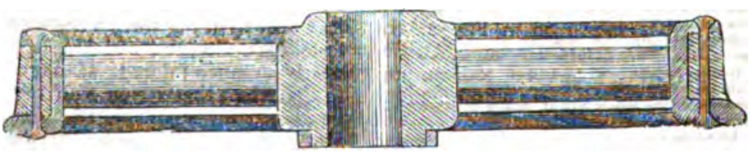
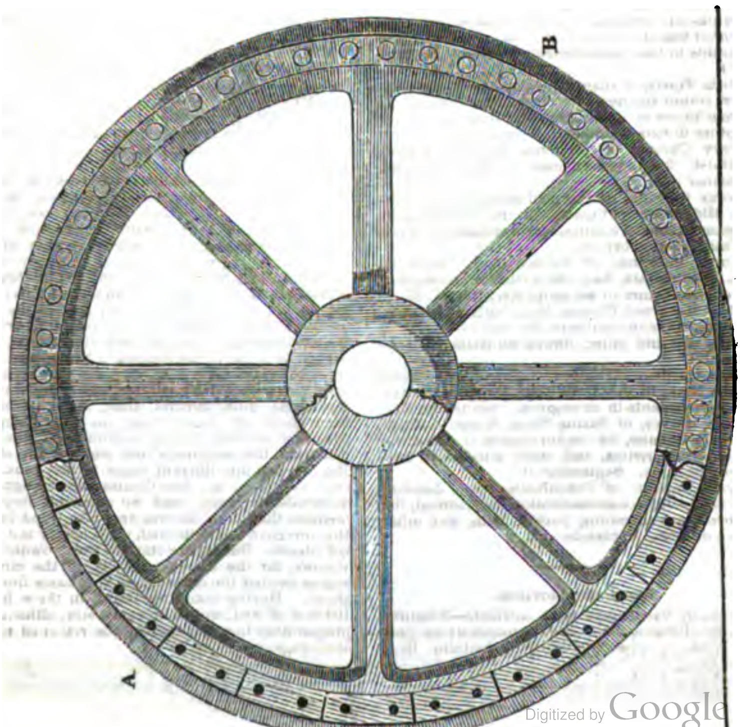


Fig. 1.



DESCRIPTION OF DIRCK'S RAILWAY WHEEL WITH WOOD TYRE.

[Read at the Meeting of the British Association, in the Mechanical Section; Glasgow, 19th Sept.]

Mr. Henry Dircks, of the firm of Messrs. Brocklehurst, Dircks, and Nelson, Engineers, Liverpool, gave an account of an improved railway wheel, of which we are enabled to furnish the following particulars. The wheel may be made either of wrought or cast iron; one of a set of four wheels made of cast iron was exhibited in the model room, and its construction was explained by diagrams, of which we give the annexed engravings. These wheels had run daily on the St. Helens railroad for the last two months, carrying an average load of five tons, and are considered by competent judges to be rather better than worse for wear. The construction of the wheel will be understood by imagining an ordinary spoked wheel, but with a deep channeled tyre, as seen in Fig. 2. In this channel are inserted blocks of African oak, measuring about 4 in. × 3½ in. prepared by filling the pores with unctuous preparations, to counteract the effects of capillary attraction in regard to any wet or dampness, by which it becomes impervious to either. There are about 30 of these blocks round each wheel, cut so as to fit very exactly, and with the grain placed vertically throughout, forming a kind of wooden tyre, each block being retained in its place by one or two bolts, figs. 3 and 4, the two sides of the channel having corresponding holes drilled through them for this purpose. The bolts are afterwards all well rivetted. After being so fitted, the wheel is turned in a lathe after the ordinary manner of turning iron tyres, when it acquires all the appearance of a common railway wheel, but with an outer wooden rim and the flange only of iron. Mr. Dircks proposed using either hard or soft woods, and various chemical preparations to prevent the admission of water into the pores of the wood, he also contemplates the using of compressed woods.

The several advantages which this wheel possesses are represented by him to be,—that the wooden tyre will wear a considerable time without requiring any repair,—that the tyre can be refaced by turning it up again in the lathe, as practised with worn iron tyres,—that it can be re-tyred with wood at little expense, and at a far less loss of time than usual,—and that both in the operations of refacing old tyres, or putting in new wood, the work can be performed without the usual labour and cost of unkeying, as the whole can be done while the wheels remain on the axles.

In regard to the working of this very novel wheel it is an opinion in which Mr. Dircks said he was borne out by experiment, as well as by the opinion of practical engineers, that it will work smoother, easier, and as some have expressed it, more "sweetly" than iron-tyred wheels, with the advantage of going well in wet weather and upon inclines, entirely obviating the necessity of dropping sand on the rails. One very important advantage yet remains, and that is, that the rails themselves will suffer less wear by using these wheels, and the fastenings, sleepers, and blocks not be nearly so much injured. If they answer to the extent that seems with reason to be expected it is possible that they will also have the effect to bring cast iron wheels into more general use.

On the Kingston and Dublin Railway the rails were originally laid, at a heavy expense, on granite sleepers, but the tremulous motion was so great and likely to prove so disastrous by loosening the rails, together with the consequent damage sustained by engines and carriages passing along the line, that they were ultimately all taken out to lay down longitudinal wooden sleepers. Now there is every reason to believe that in all such cases the effect of these wooden-tyred wheels would be, by obviating this injurious tremulous motion, to favour the continued employment of stone blocks in the laying of railways where preferred. The principle of these wheels is generally admitted to be most excellent; in this application of wood the wheel is not rendered either unsafe or unsightly, for they are both strong, durable, and capable of being made to any pattern. This new construction is particularly applicable to driving wheels for locomotives; a wheel of this sort may be readily stopped by using a cast-iron break and does not undergo that wear which might be expected from the friction it then has on the rail. The wood by use becomes exceedingly close and firm, acquires a smooth surface, does

not prevent the ringing of the wheel when hammered, and is not in outward appearance readily distinguishable from metal.

Description.

Fig. 1 represents the wheel, half in section, as at A, and half complete, as at B, the view being a front elevation.

Fig. 2, edge elevation, in section.

Fig. 3, showing the channeled tyre *a b c*, with the wood inserted at *d*, fastened by the pin or rivet *e e*.

Fig. 4, *d* represents one of the wooden blocks in perspective, perforated with two holes, *f f*, for receiving the pin or rivet.

Fig. 5, cross section of arm of wheel.

ON EXTINGUISHING FIRES BY STEAM—WOVEN HEMP HOSE, &c.

Sir,—At the recent meeting of the British Association, where "all have their curious somethings to disclose," Mr. Wallace advocated the employment of steam for extinguishing fires in steam-boats, as narrated at page 361 of your last number.

After the extensive and complete investigation of the merits of steam as an extinguishing agent, and the result of the Lancashire experiments, recorded in your previous volumes, I must confess I was somewhat surprised at this resuscitation of the question. My present object however is to point out the fallacy of Mr. Wallace's experiments, and the erroneous nature of the inferences attempted to be established by them. In the first instance, a fire of great energy and of unusual magnitude (composed of "4½ cwt. of very combustible materials, such as tar barrels, &c.") was kindled in a small cabin, which was closed up and a jet of steam admitted. The fire goes out! Would it not have done so, even if no steam had been present? Would not a fire of such a character, confined in a limited space, holding at first but a comparatively small portion of air, and further access of air being almost entirely prevented, have stifled itself in the same time that it was found to be extinguished, as supposed, by the agency of steam? Again, in another experiment, two grates containing unusually large fires, each of "about one cwt. of blazing coals, well kindled," were lowered into the cabin, the hatch on the deck and the cabin doors were shut, and the steam let in; in fifteen minutes the fires were found to be extinguished—as a matter of course. But a coroner's inquest seems necessary to be empannelled, to ascertain whether a verdict of *fire-slaughter* will lie against the steam—or, whether it is not (as I contend) a clear case of *felo de se*, by self suffocation!

The importance of ascertaining this point, in order to give the slightest value to the experiments, must be obvious.

It unfortunately happens, however, that the experiments of Mr. Wallace, whether they are right or wrong in *principle*, can be of little practical utility. I do not recollect a single instance of fire in a steam-boat, where any such application of steam, even if beneficial, could have been made. Fires in such vessels most commonly arise from spontaneous ignition of the coals; or from the coals, or timbers of the vessel, being placed too near to the heated surfaces of the machinery, in positions altogether incapable of being enclosed for the application of the steam-bath. The accidental ignition of the cabin furniture (the only case in any way analogous to Mr. Wallace's position) is a very unusual occurrence. After the reading of Mr. Wallace's paper "it was stated" (by way of a clencher I suppose—we are not told by whom) "that in Philadelphia, and now in London, the firemen always direct the water towards the lowest part of the fire, *that it might be converted into steam.*"! Philadelphia is so far off, that I suppose "we may as well believe it as go to see." As for London, however, the statement is wholly untrue, and without a shadow of foundation; and the inference is, that the other is ditto. The firemen of London recognise the assistance of no such auxiliary as steam; the practice imputed to them was unknown, and although now made known, will continue unpractised.

Mention was also made of the woven hemp hose for fire-engines, said to have been used in Russia more than 40 years; it might have been stated that it was used more than twice 40 years ago in England, and abandoned. Very strenuous efforts have recently been making to effect its re-employment here, but without success. Trials have been made with several lengths by the firemen, but

their destruction was so rapid and their bursting frequently so inopportune, that this material has again been consigned to well merited oblivion. The modern process of rivetting leather hose, instead of sewing, has given to that article a superiority and fitness, both in material and manufacture, not to be surpassed.

At a fire which happened at Clapham a few months back, for more than half-an-hour after three fire-engines from London reached the spot, no water could be obtained from the mains of the Vauxhall Water Works, and at my request the three engines were placed in a chain from a pond on the common, and their stock of hose was just sufficient to reach the fire; but one length, belonging to the West of England engine, was unfortunately the *woven hose,* and no sooner had the engines commenced working, and the water reached the branch-pipe, than this length of hose burst—thereby, for a short time, discomposing the well-arranged system of operation. This length was one given to the West of England in exchange for another which had previously served them a similar trick.

I am, Sir, yours, respectfully,

WM. BADDELEY.

October 1, 1840.

THE "CURIOUS ANTIQUARIAN RELIC."

Sir,—In your last Number (892) I observed an engraving of a brass ring, stated to have been dug up in a field near Hitchin, in Hertfordshire. On examination, it appears to be a *fibula,* or broach, and has evidently had a pin extending from one side to the other. The inscription, which may probably be dated about the year 1450, may be read as follows:—"*Jhesvm Nazarenvm,*" or Jesus of Nazareth. There can scarcely be a doubt that it was used to fasten the dress, over the bosom of a dead body, before it was committed to the grave. It was anciently a custom for persons to be buried in the habits of friars, &c., imagining, from the professed sanctity of these persons, that the dress would be a passport for them at the last day. A broach of this description would be found necessary, on account of the thickness of the woollen clothes then used.

A mass of the five wounds of Christ, called Jesus mass, was instituted at Coventry in the year 1464, and a bell was then put into St. Michael's steeple, with a Latin inscription, thus translated:—"Jesus of Nazareth, King of the Jews, have mercy on me."

In August, 1830, a silver broach, with a moveable pin, about the size of a five-shilling piece, was dug out of a grave in the same city, bearing the following inscription on the rim—on one side "*Propter me hodie,*" and on the other "*Cras dabor non.*"

I remain, Sir,

Yours, obediently,

W. READER.

September 14, 1840.

HELT'S PATENT STOVES, NOT ORIGINAL—NECESSITY OF FREE VENTILATION, &c.

Sir,—You notice in your Magazine a patent by Mr. Alexander Helt, for an improved stove to admit a current of fresh heated air into the apartment to be warmed. How Mr. Helt expects to sustain his patent I know not, stoves on the same principle having been used for many years, and by myself in my dining and drawing room for the last twelve, causing the rooms to be of any required *uniform* heat, at a very small expense of fuel, and without any cold currents of air. Anything of that kind rather than the *non-ventilating,* deleterious Arnott stoves. The public is now finding out their pernicious effects, and it is doubtful if one be in existence at the close of next winter. The Doctor, in his work on ventilation, recommends it as essential as food, and then gives a stove without any, except by an open door or window which, he says, "will give the rheumatism, chilblains, &c. An Arnott's stove introduced into a school which was previously considered perfectly healthy, caused five cases of rheumatic fever in two seasons, besides head-aches, flushings, &c. &c.

I am, Sir,

Your obedient servant,

AN ADVOCATE FOR PURE VENTILATION.

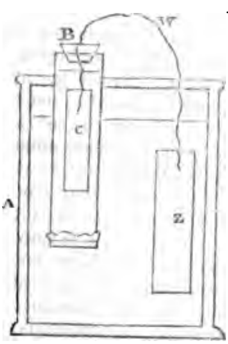
September 29, 1840.

THE ELECTROTYPE PROCESS.

The last number (6) of Savage's Dictionary of the Art of Printing,* contains, under the head of galvanism, a detailed account of the progress, &c. of the electrotype process, in its various applications to the purposes of the printer, with some beautiful specimens of impressions from wood engravings by Branston, in juxtaposition with similar impressions, taken from copies in copper by galvanism. We have extracted the following familiar explanation of the apparatus and process, for our pages, and beg strongly to commend this work to all who are in any way connected with, or interested in, the important Art of Printing.

After a brief historical notice, Mr. Savage introduces the letter of our esteemed correspondent, Mr. Spencer, (see page 128) and then proceeds to observe:—

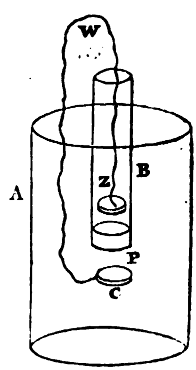
"The annexed figure and explanation will afford an example of the action of a voltaic apparatus, and will be sufficient to render the subsequent details intelligible. A, is a vessel filled with a solu-



tion of common salt, which is a compound of chlorine and sodium; B, is a tube immersed therein, closed at the lower end with a piece of bladder stretched over it and firmly tied; this tube is filled with a solution of blue vitriol, that is, a compound of sulphuric acid and oxide of copper. A plate of copper, C, and one of zinc, Z, connected by means of the wire, W, are immersed in those fluids. The zinc decomposes the salt, with the chlorine of which it unites, forming chloride of zinc, while the sodium of the salt is repelled, and passing through the bladder, enters the solution of sulphate of copper, which it decomposes, uniting with the sulphuric acid and oxygen to form sulphate of soda, and setting free pure copper in the form of beautiful crystals, which are deposited on the plate, C. The connecting wire, W, serves to convey electricity from C to Z, and thus the action is maintained so long as any common salt and sulphate of copper remain undecomposed.

"Mr. Spencer's first attempt was made with a piece of thin copper plate, which he covered with a cement of bees wax, resin, and Indian or Calcutta red. The plate received its coating while hot, and on becoming cool, the experimenter scratched the initials of his name upon the plate, being careful to clear away all the cement from the scratches, so as to expose the copper below. A piece of zinc was attached to this plate by a copper wire, and the voltaic current was set in action by means of the simple apparatus shown in the adjoining figure.

"A, may be supposed to represent a glass vessel of convenient form. B, a gas glass stopped at the lower end, P, by a piece of plaster of Paris, to the depth of three-quarters of an inch. Z, a plate of zinc, and C, a similar piece of copper, a coin or any other metallic substance to be acted upon; and these two are con-



nected by a copper wire, W. The inner vessel may be kept in its place by a cork, or any other means that may happen to be more convenient. A solution of sulphate of soda is poured into the gas glass, and the wire connecting the zinc and

* Dictionary of the Art of Printing. By William Savage, author of "Practical Hints on Decorative Printing," and a treatise "on the Preparation of Printing Ink, both Black and Coloured." London, Longman and Co.

copper plates being bent, as shown in the figure, the zinc plate is immersed into the solution of sulphate of soda, and the copper plate into the solution of sulphate of copper.

"In a few hours, Mr. Spencer, in his experiments, found that the portion of the copper rendered bare by the scratches was coated with the pure bright deposited metal, while those portions which were still covered with cement were not acted on. It now became an important inquiry whether the deposition would retain its hold on the plate, and whether it would be of sufficient solidity to bear working from; that is, supposing an etching or engraving to be made, and the lines to be afterwards filled up with copper by the voltaic process, whether such lines could be printed from.

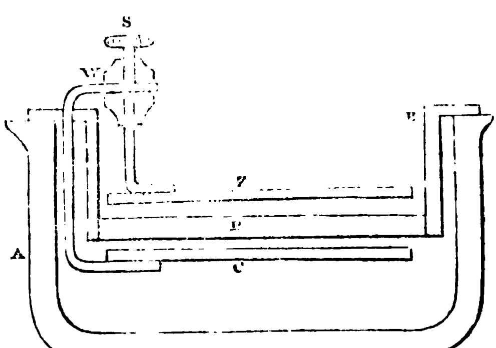
"In order to answer this last question, Mr. Spencer coated with cement a piece of copper, and with a steel point endeavoured to draw lines in the form of network, so as to penetrate the cement and expose the copper. After this plate had been exposed to the voltaic action, and then heated, so as to get off the covering of cement, the copper network came off with it. This happened many times; but by an accident it occurred to the experimenter to employ nitric acid to the plate, after it had been cemented and engraved on as before. It was then subjected to the voltaic process for forty-eight hours, when the lines were found to be entirely filled with copper. On applying heat, and then turpentine to get off the cement, it was found that the voltaic copper had completely combined with the plate on which it was deposited.

"A plate was then coated with cement, and lines worked upon it by an engraver; but these lines were of a wedge-shaped form, leaving only a hair line of the copper exposed at the bottom, and a broad space near the surface; and where the turn of the letters took place, the top edges of the lines were galled and rendered rugged by the action of the graver. All this was objectionable; but another plate, similarly prepared, and engraved on with a sharp point, had the copper deposited on the lines; and this was printed from successfully.

"This was an attempt to deposit lines upon a plate of copper by the galvanic action, and thus form an engraving in relief, which I have doubts of being successfully practised with finished subjects.

"The application of heat separates the two metals, in consequence of their different expansibility when subjected to its influence.

"Mr. Spencer gives the form of another apparatus on a more extended scale, which he recommends, as it may be employed in large works.



"A is an earthenware vessel to receive the copper plate and the solution of sulphate of copper, in which it is to be exposed. B is another vessel of earthenware or wood, of such a size that it may fit into the outer one, as shown in the drawing; the bottom of this vessel being formed of plaster of Paris, or some other porous substance, which while it retains the solution of common salt may permit the voltaic action to go on without impediment.* C is the copper plate to be

* Mr. Bachhoffner recommends a mixture of one part of sulphuric acid diluted with forty parts of water

acted on by the electricity upon which copper is to be deposited. Z is the zinc plate, and the two are united by the wire W, which may either be done in the manner exhibited in the second engraving, or by the use of a binding screw S."

The following directions by Mr. Bachhoffner, are taken from that gentleman's very full account of this interesting process in the last number of the *Polytechnic Journal*:—

TO OBTAIN ELECTROTYPE COPIES FROM CASTS OF METALS.

"The casts may be made of fusible metal, wax, plaster of Paris, or black-lead.

From Fusible Metal.—The alloy for this purpose is a compound of five parts of bismuth, three of lead, and two of tin; or they may be taken in the proportions of 8, 5, 3; these, when melted together in any convenient vessel on a common fire, may be afterwards melted in a cup or saucer, over the flame of a lamp or candle. To obtain a sharp and perfect cast, requires some practice, as the mere pouring the liquid metal on the coin or medal will not be sufficient. There are several modes of proceeding, each depending on the sudden cooling of the fluid metal to prevent its assuming a crystallized structure.

To make the Cast.—The melted metal is to be poured on a few folds of paper, from which, with a piece of card, carefully remove the thin film of oxide which frequently covers the surface, the metal being at the same time spread out so as to leave a margin of at least a quarter of an inch round the medal; when the fusible metal is on the point of hardening, the medal is to be suddenly and with some force, dashed on to it, pressing it firmly until it sets; when somewhat cool, the medal readily leaves the cast, or, as they are commonly called, dabs, and may then be put to work as previously described.

From Surfaces not Metallic.—Under this head we may include wax, sealing-wax, plaster of Paris, paper, wood, &c. In all these cases, although a metallic surface is not absolutely necessary to receive the deposit, yet a conducting one is indispensable. Many trials have been made to coat the surface of non-conductors with gold and silver leaf, tin foil, and the bronze powders, all of which are very far inferior to that of pure plumbago,* which is not only very readily applied, but adheres to the surface without injuring it; and is, when pure, a very good conductor. Care must, however, be taken, in laying on the plumbago, not to scratch the surface, if soft; and also that the coating of plumbago be carried on to the point at which the conducting wire is inserted, to maintain the line of continuity for the conduction of the electric current back again to the zinc.

To cast in Wax.—To a piece of copper or lead somewhat larger than the object to be copied, solder a stout piece of copper wire; prepare a composition consisting of five parts of pure white wax and one of Venice turpentine; or, if the temperature is such as to admit of the wax being moulded without, it may be used alone. Place upon the upper surface of the piece of copper or lead a sufficient quantity of the wax, and then place the medal on the wax, and over it, a piece of wood. Finally, put the whole under a screw press: should this not be at hand, a common table-vice will supply its place. The medal, after having been pressed into the wax, is to be removed; it will leave a very sharp intaglio impression, which must then have the charge of plumbago† passed carefully over the whole of the wax. It may now be put to work."

REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS APPOINTED 7th FEB. 1840, TO ENQUIRE INTO THE EXPEDIENCY OF EXTENDING COPYRIGHT OF DESIGNS.

(Continued from page 346.)

Mr. Augustus Applegath, of Crayford, Kent; has been a printer thirty years, and a printer of calicoes for fifteen years. Is conversant with the use of designing, as a master printer, but is not a designer himself. Is aware that large sums are paid to original designers; has paid about 60*l.* a week to designers and pattern-makers. By pattern-makers, he means the people who engrave and cut the design. Has sustained great loss in consequence of the present inadequate protection of designs; by having many patterns

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* We are indebted to Mr. Murray, of Regent-street, for this very simple and convenient contrivance.

† By employing the plumbago as a conducting surface, I have recently succeeded in copying, in copper, some of the very beautiful wax medallions and portraits executed by Mr. Wyon. This is a very desirable mode of finishing portraits, &c., in metal, and promises to be valuable.

copied shortly after they had come out, and before the sale of those patterns had remunerated him for the expense of producing them. Finds that the inadequate protection tends most decidedly to prevent the designing of very expensive and elaborate patterns: not only does it prevent the production of such pattern, but he finds it necessary in the working in his trade, to bring out as few original patterns as possible; finds it will not do for him to labour very much to bring out new original patterns, because if he did so, all his patterns would be copied; no person would print with him; therefore he makes up patterns one with another; he brings out a considerable quantity of patterns; he brings out as many patterns as he can, in order to baffle the copier by the variety he brings out. Endeavours to make a trade by variety rather than by excellence. Conceives that the present inadequate protection tends to prevent the application of design to matters to which it would be applied, if a longer term of protection existed. Printed hangings for architectural decorations of rooms have lately been printed in this country, within the last four or five years; has been a good deal engaged in that trade. Some of them are of a high class of art; that is, as high as we dare produce under the existing circumstances; has specimens here which require a great deal of time in their production; they are like class drawing, every defect appears, and you cannot often tell how they will look until they are produced in cloth. Exhibits one which he is unwilling to bring out at present, on account of the expense of blocks; it will take 32 or 35 blocks; he cannot bring it out, it would be copied immediately. Exhibits another pattern which was drawn four times before he could satisfy himself with the effect; this has been executed and sold; it was drawn from nature; drawings of the flowers were supplied to him; it may be imagined that it cost a great deal of money to draw that three or four times over. Should think this pattern cost at least 50*l.* drawing, and in the execution of the blocks, but he was not at the expense of the drawings; the house by whom he was employed supplied him with the designs. The grouping of the flowers was all that was left to his designer, and it was drawn over three or four times before the effect was satisfactory. Thinks his employer paid 20*l.* for the drawings of the flowers, in addition to the 50*l.* spoken of. Has stated that the class of art in the designs just exhibited is as high as he feels warranted in bringing into exercise under the present term of protection; if that term were extended, a higher class of art would be introduced into these manufactures. If he could be favoured with a real protection, giving a sufficient copyright, he would immediately employ artists of the first character; would not be content with persons that they call drawers, or even inferior artists. Has not made any effort towards that, further than by requesting his friend Mr. Sydney Smirke to get him drawings; thinks his father has drawn several, but he has never pleased himself. It was with a view to architectural decorations; with a view to improve the character of hangings, and also pannels for tapestry. These are not at present produced by any English printer that he knows of; they would be produced on woollen cloth. There have not been any attempts made in this country to produce designs of this kind upon pannels for the decoration of rooms. Thinks there is a set of French work to be seen at Pratt's in Bond-street. Thinks that manufacture would be likely to be introduced into this country, if an adequate term of protection was given. Should be disposed to undertake it himself, with proper protection. Had the pleasure of returning from Paris with Sir David Wilkie, who was returning from Italy, and was quite full of the Italian palaces and other things which he had seen, in which it is very common to decorate them with arabesques, and introducing medallions in pannels. They soon became friendly in consequence of this coincidence of feeling, for he had been wishing it for some time; they talked about it a considerable time, and Sir David Wilkie said, that if witness would take it up, he would at any period, and however he might be engaged, make a set of drawings for the purpose. But it would be of no use troubling Sir David Wilkie to forego his lucrative occupation to make drawings that would be immediately copied. The want of protection deters him from making an attempt of the kind; because it would be some time before things of that kind would be sold sufficient to repay the expense. His own idea is, that the copyright of a pattern ought to be the same as the copyright of a book; cannot see any difference between the two things. If he was to produce a beautiful engraving, and publish it as a print, he would have a long term of copyright. His old ideas as a book printer are so mixed up with his present occupation, that he cannot see it in any other point of view. Cannot see why thought is to be protected in one case and not in another. The present limited term of copyright checks any great attempt being made to improve the ordinary objects of the art in its application to designs for manufactures, for the reasons stated—that they cannot go to much expense about any one thing. This has a tendency to keep the designs for those manufactures within a very simple and inartificial class. If they could very much

improve any one article, is satisfied that the trade would increase accordingly; and you have one strong proof of that in the manufacture of pocket handkerchiefs, which, when he entered upon it, was in a very low state, but which has since improved to so great an extent, that now very beautiful things are produced.

The result of his conviction is, that an extended term of copyright would induce a greater outlay of capital in producing elaborate designs, and tend to raise the character of the art generally. Is sure it would in his own case, and thinks it would with others. Cannot possibly imagine that it would have the effect of reducing the extent of trade at present done. He should expect that the more he sowed, the more he should reap; that the more pains he took in producing new and good things, the more likely he would be to be rewarded by the public for his labour and expense. Thinks it exceedingly probable that the effect of introducing a greater variety, or a higher class of art in the home market, would be to cause more dresses to be worn,—because, what is a dress after all? It is mere fancy and taste, it is not a mere covering, otherwise we should have never had any printed dresses used at all. It is like paintings, there is no reason why any gentleman, should possess a painting, but when he sees a good one he wishes to have it. Believes it would also have a tendency to extend our export trade, inasmuch as the Americans buy many French things because they think their style better than ours. It would tend to produce an advantageous competition among the designers themselves; it would very much raise the character of the class of persons he employs as designers, and should employ more if he had anything like a real protection. Should be quite easy in incurring the expense, and should not fear embarking greater sums; but where it is limited to three months, a thing no sooner comes out and becomes known, than it is copied. Thinks that the art of printing would be extended into new channels if greater protection were afforded. Thinks that tapestries would be very much printed. Has a set of designs for churches, which he is afraid to execute, for the reasons already stated. He should not venture to do these, (*producing some patterns*) in the present state of the law. Has no idea that any particular improvement could be made in the art of printing, as at present applied, further than that the designs might be bettered. Thinks that several facilities and advantages would be given to the printer in conducting his trade, by extending the term of copyright, and for this reason, that being relieved from the necessity of bringing out so many patterns as mere varieties, he would give more attention and time to patterns. He would then labour to bring out more beautiful and good patterns, and would then gain by his successful patterns. At present if he brings out ten patterns, and one of them succeeds, that pattern would repay for the unsuccessful ones; but the moment they have got a prize, the copier runs away with it, leaving them to pay for all the blanks. Is of opinion that an extended term of copyright would be advantageous to designs, inasmuch as the party who now employs himself in copying would then produce originals, and would share in the protection of the law. Thinks also that if he had sufficient copyright, another party might bargain with him for his design. Supposing, for instance, he had produced a good pattern, and after using it three or four months, he wished to bring it out, it would be open to him to bargain with any party just as an author does with a bookseller for an edition of his works. Has only enjoyed the present three months copyright, a year; because he prints on silk and on chalis, which were for the first time included in Mr. Poulet Thomson's Bill of last year. Is decidedly of opinion that an extension of the term of copyright would increase the number of parties now employed as designers. If he were assured of its being carried into effect he should seek immediately to engage two or three persons he knows. His observations refer to an extension of from three to twelve months, because he is not permitted to think of his own views which go to a greater extent. One strong reason why he should engage more drawers and pay them more liberally, is, that having then more time to sell his goods, he should act with more confidence, and want of confidence is a very bad feature in the present system. He does not buy patterns with any confidence; the draper does not order with any confidence; the retail draper does not buy with any confidence; the lady who buys the dress, does so with the impression that it is hardly worth while to buy it; and by-and-bye, when her servant gets the same thing on, she goes back to the shop and actually reproaches them with having sold her a pattern which is hawked about in a common way. How they manage to get a trade, he hardly knows; it is only by means of exertion. Speaks most feelingly upon the subject, because he has the management of the patterns. He brought out 513 patterns last year in a small London trade; but it is only by means of great exertion they are enabled to make any way at all. If the committee could enter practically into the situation of the London printers, they would see that it is a trade of the most intense anxiety. In making designs he frequently takes ideas from French patterns and also from old English patterns; many of the French patterns he takes entirely; it is part of his system of

trade. Does not consider himself entitled to protection for those copies. His present principle of trade is to bring out as many new patterns as possible. A pattern lasts only a certain time, and it is variety that makes the trade now, rather than excellence. In fact he cannot aim at great excellence because he is copied immediately if he brings out a beautiful pattern. If he had more protection, should try to produce things of superior excellence in point of style to what he does now. Brings out patterns for two periods of the year; viz.: for spring and autumn, but has no particular rule in his fancy trade; he endeavours to keep the men employed all the year round; is not like the great Manchester houses, who have particular days and seasons,—his pattern is cut and printed at once. During the whole of the winter he brings out light chalis, which are used for dinner dresses: but it is the custom of the trade generally to bring out the spring patterns about the latter end of February or the beginning of March. The season is pretty nearly over at the expiration of three months; does not do much business in July. Understands that the Lord Chancellor has declared, that an imitation of any print is not to be commenced till the expiration of three months. Then, taking that it requires a fortnight at least for a copier to bring out any thing, decidely thinks it would not answer any person's purpose to copy a spring pattern at the end of that time; but the extension of the copyright would be very beneficial to witness in this particular; supposing the spring patterns have not been very successful, or supposing there has not been a good trade, if he had the opportunity of putting a ground to them, and bringing them out in the autumn, and so, if he had the opportunity doing the same with the autumn patterns, and bringing them out in the spring, that is a thing he should frequently do if he had longer protection; he can easily change the grounds. The styles produced for the autumn are generally different from those produced for the spring. His observations apply to printing on chalis, not upon calicoes—does not attempt them. The printing of chalis is an article of recent introduction, about six or seven years. Thinks it is increasing very much this year. Is printing a great many more chalis than *mousseline-de-laines*. But thinks this arises from the *mousseline-de-laines* trade being taken to Manchester. The chalis is wool and silk, the *mousseline-de-laine* wool and cotton. Three months is scarcely any protection at all in his trade. As a general principle, the longer the protection, the better it must be for the proprietor of the pattern, and the more opportunity he has of reimbursing himself. Is a good deal driven by the great anxiety existing in the public mind to have a constant succession of novelties. Supposing he shows his customers the same patterns over again, it is a common answer to say, "I have seen this before; I want something new." And he has the same feeling himself; when he goes to town and sees the same things upon the counter, he says, "I must change these." Taking the question generally, these changes are required fully as often as every three or four months; but the copiers take only the best patterns, and what they copy will sometimes run three or four years. He has patterns that have happily escaped them, which he is still working. All the good patterns are not copied, but a great many of them are. Cannot say exactly how many, but thinks he has had 12 out of 60 copied in one season. It may be said this is but a small proportion after all; but they are the best; it is the prizes in the lottery which are taken away. If asked, can there be novelty in a pattern which contains an object taken out of another pattern? Should say certainly yes; there may be. A pattern may be a new pattern, though containing all the objects of another pattern. All the objects may be taken from another pattern, yet they may be very different, quite different enough to be a new pattern. If the combination makes it a new pattern, has no difficulty in saying that he should be entitled to a copyright in it. Considers he has a right to look over his neighbours' patterns, and to make a pattern of his own from the objects and ideas which he finds in his neighbours' pattern; provided that in so doing he does not copy his neighbours' pattern. Has a right to take all his ideas, if, out of those ideas he makes a new pattern. Sees no injustice in any law that allows this appropriation of his neighbours' ideas. If they are made new, his neighbour can have no right in the ideas; ideas are common to all; it is the application and use made of the ideas which gives the copyright. All patterns are made one from another; there are only a few original objects in the world. It may be said, from the vast number of millions of patterns that have been produced, must not those patterns have combined in one shape or another, every pattern that any pattern drawer can conceive at the present time? Should say decidedly not; that is quite contrary to all experience. We find hosts of new patterns coming out continually. Does not consider that copyright of design at all extends to colour; has never so contemplated it. It is entirely limited to the design—to the pattern, and a variation of the colour with the same design would not create originality in any way; the pattern itself must be varied as well as the colouring of the pattern.

Mr. James Stirling resides at Island-bridge, Dublin; is manager of Mr. Henry's calico

print works, who has been 20 years engaged in that trade. Mr. Henry keeps his own staff of designers; there are eight employed at present. The cost of maintaining that establishment of designers, is about 800*l.* a year. He pays his foreman 300*l.* a year; he has others at two guineas a week and some at lower wages. Previous to the passing of Mr. Poulet Thomson's Bill of 1839, there was no prohibition against copying the designs of other persons in Ireland; the Copyright Bill did not extend to Ireland. In addition to the staff of designers kept by Mr. Henry, he was in the habit, before 1839, of copying from other persons; they had rather a bounty for copying in Ireland previous to 1839. When witness first went into the business, eleven years ago, their engravings were all got from England, and the reason was, that the copyright not preventing their getting them immediately upon their being engraved, the engravers would engrave those patterns upon rollers at half the price at which they were engraved for the English printer, so that where he paid 10*l.*, the Irish had it for 5*l.* The engraving of Mr. Henry's designs is performed on his own premises; he keeps his own engravers and cutters. His expenses for wages alone, for engraving copper rollers for 12 months, would be a thousand and some odd pounds, the procuring of tools and other necessaries would amount to 600*l.* more, so that his expense for engraving is 1,615*l.* For block cutting for 12 months the expense has been 760*l.* His expense for block cutting and engraving previous to 1831 was a mere trifle; what he paid for engraving was paid to Manchester. At present the engraving costs about 8*l.* a pattern; formerly he does not think it would average near the half of that sum. So that during the period when Mr. Henry was free from all trammels of copyright protection, and had liberty to copy *ad libitum*, the amount of employment given by him to original designers was to other designers, whereas he now retains eight in his own employment, and the amount which he then paid to engravers did not exceed one-half the amount which he pays at present. So that in coming under a system of protection, he has given additional employment and additional encouragement both to designers and engravers; it has increased the one eight fold, and, he should think three times the other. The law of copyright now extends to Ireland, giving them three months' protection; but conceives that term is worth nothing, it is not adequate to secure a fair remuneration for speculations in designing, and in producing and for the investment of capital. He speaks both of the foreign and the home trade. He should think that six months would afford a protection for the home trade, where the party is printing merely for that, and has no occasion to show his pattern before he makes his delivery; but if he is printing for the export trade, six months would not be any protection to him. Six months would not be a sufficient protection, although the designs printed might be suitable both for the spring and the winter season. Nothing less than 12 months would be a sufficient protection for the foreign trade. Has suffered to a very great extent from having his patterns copied; the copying has been chiefly carried on at Manchester. The copies have generally been designed for the foreign market; is so much engaged in printing for the foreign market, that he designs chiefly for that object, though many patterns are also suitable for the foreign trade. Is now selling to the home trade for spring, patterns that were engraved for the export market in August and September last. They are not protected now, the copyright expired three months ago. Finds producing novelties to be the only thing that will ensure a sale; and it has gone to this extent on account of being so repeatedly copied, that where he was in the habit of taking from export merchants orders for 10, 20, 30, or 40 pieces, and larger quantities of a pattern, he can now in no instance get an order for more than five pieces. Has at former periods received orders for 200 pieces of one pattern when it has been a block pattern; and has received orders for 1000 pieces of an engraving; but in that case he confined the patterns to the party who gave the orders. Nobody will engage a pattern now, from the apprehension of its being copied. Cannot at present take an order from any merchant without giving a guarantee that those goods have not been sold before, and further, that no goods shall be delivered to one party sooner than another. Three months does not give adequate protection, arising from a knowledge among his customers that his patterns are copied. He does good work, and produces good patterns which are run at in Manchester as soon as they are out. His goods are all packed at his works, but with every package for exportation, he sends a a pattern-book, containing a pattern of every piece in the package, and a duplicate of that pattern-book to the merchant who buys the goods. He sends pattern-books to the shippers, who, he believes, sometimes sends them to the printers who copy them. Has seen a book that was given for that purpose—given by the merchant. Knows the fact of a printer going to the merchants to apply for the books. Produces about 300 patterns in the course of a year upon an average; cannot say how many of these have been copied, but the copying has been so extensive, that in general terms, should say the best of them have all been copied; the injury done was as great as if the whole had been copied. Will state

to the committee an instance, showing that this copying is carried to a great extent. On the 12th October last he took an order for 700 pieces from a London merchant who trades to the West Indies, and had been a customer for years, and had been doing a large business with him. In the 700 pieces there were eighty-three patterns. These goods were delivered about the middle of December. Delivered the pattern-book himself about the 20th. Was informed by the merchant, that in January, goods were to be had, pattern for pattern, the same as those sold him in December, 20 per cent. under the price charged, but on an inferior cloth. So that the entire 83 patterns were in the course of 1 month copied and offered for sale in competition with the original at a reduction of 20 per cent. Four years ago this merchant was doing a large business with him, which continued up to March 1838; since that it has gradually fallen away, and at length ceased in consequence of the way in which his patterns were copied at Manchester. The orders he used to receive are now given to parties who are copying his patterns in Manchester —knows that. Has had his patterns copied after the end of 3, 6, and even 12 months. A protection of 12 months would not prevent that, but if he had 12 months' protection, fancies he should be paid, and would not care who copied after that, because he would then be producing something new. Another serious instance of copying was as follows: in June last witness sold goods to a house in Jamaica, patterns very suitable to that market. In January, had a letter from his agent in Glasgow, giving an extract of a letter from Jamaica, countermanding their order, because the goods were then coming out from Manchester on lower cloths at lower prices. Knows the printers who copied in these instances, but did not apply for injunctions against them. Was not able to do so till within the last ten months. The law did not extend to Ireland; and to mark the pieces as the Act directs is a very troublesome thing; the three months' protection is not worth it; the first sale is all that three months' protection could ensue, could have no repetition with that protection, and therefore does not mark the pieces. Would mark them for 12 months', but not for three months' protection; the parties copying the goods have only to hold them over a month, or six weeks at most, after taking the time to copy them, to be out of the time of protection, and the buyers being aware that those are coming out, will not give witness a repetition of their orders. Objects to a registration in a great measure; but were he insured 12 months' protection, would take the trouble of making the pieces for it, and registering. If a system of registration were introduced, and he were perfectly secure that no one should see his patterns, if it cost but a very small trifle to register, and the tribunal before which it was to be tried, was one where no copier could have any influence either in presiding or appearing further than to answer witness's affidavit, his objections to a registration would be greatly overcome.

(*To be continued.*)

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

William Winsor, Rathbone-place, Oxford-street, artists' colourman, *for a certain method of preserving and using colours.*—Rolls' Chapel Office, August 22nd, 1840.

This invention applies to colours known among artists as "bladder-colours," and consists in the substitution of glass or metal tubes for the bladders in which they have usually been put up. In order to adapt them to this purpose, cylindrical glass tubes, open at both ends and furnished with projecting lips or rims, are fitted with an elastic piston of cork, or a compound piston of cork, paper, &c. This piston is securely fastened by some cement, not acted upon by the vehicle in which the colour is mixed, upon a central block of hard wood, ivory, metal, &c. tapped with a coarse female screw. A corresponding male screw of metal or other suitable material, rather longer than the tube, and terminating in a milled head, works in that of the piston. A circular plate of metal, rather larger than the tube, is tied upon one end by a piece of membrane placed over it, and secured by the rim before mentioned. This plate and membrane has a hole, through which the male screw slides freely up or down. This screw being put into its place and screwed round, draws the piston up to the top of the tube, which is then filled with the colour previously ground and properly prepared for painting; the open end of the tube is then closed with another metal plate and membrane, having a small hole closed by a temporary stopper of wood, ivory, or metal. In this state the colour is supposed to be *preserved* free from the pernicious effects of atmospheric influence. When required for use, the stopper is to be taken out, and a few backward turns given to the screw, which will cause it to project a short distance from the head of the tube; upon pushing it in, the piston, hitherto quiescent, will be forced down, and the colour squeezed out from the lower aperture on to the palette. Of course, the screwing and pushing must be proportioned to the quantity of colour required for use.

It seems to be taken for granted, that the apparatus will continue air-tight—that the

piston will always remain stationary during the rotation of its screw spindle—that no clogging from the drying and solidification of the colour will ensue—and that no inconvenience will attend the use of this philosophical substitute for the "colour-bladders" of our forefathers.

PETER BANCROFT, LIVERPOOL, MERCHANT, AND JOHN M'INNES, LIVERPOOL, MANUFACTURING CHEMIST, *for an improved method of renovating or restoring animal charcoal after it has been used in certain processes or manufactures to which charcoal is now generally applied, and thereby recovering the properties of such animal charcoal and rendering it again fit for similar uses.* Petty Bag Office, Sept. 22, 1840.

This is proposed to be accomplished by the use of alkali, in the following manner. In order to get rid of the colouring matter, and other impurities remaining in charcoal that has been employed for various discolouring and purifying processes, it is to be well washed and then saturated with a solution of caustic potash or soda (spec. grav. 1.06) and left at rest for several hours. The caustic alkali will abstract and hold in solution the various impurities of the charcoal; this being drawn off, the charcoal is to be washed in a running stream of hot water, till every trace of the alkali is removed, and it is then again fit for use. The claim is for the method of restoring animal charcoal, and rendering it fit for use, by the employment of an alkali.

THOMAS TASSEL GRANT, OF HER MAJESTY'S VICTUALLING OFFICE, GOSPORT, *for Improvements in the manufacture of Fuel.* Petty Bag Office, Sept. 24, 1840.

These improvements consist of a mode of manufacturing artificial fuel from coal dust in combination with coal tar or other bituminous substance. The tar being thoroughly heated, small coal is incorporated therewith, in the proportion of 20 lbs. of the tar to every cwt. of the coal dust. When perfectly combined, this material is moulded into bricks for use.

HENRY SMITH, OF BIRMINGHAM, LAMP MANUFACTURER, *for improvements in gas burners and in lamps.* Enrolment Office, September 25th, 1840.

The improvements consist in the application of a horizontal deflector to the argand burners of gas and oil lamps at a slight elevation above the point of combustion, so that the current of air rising around the outer cylinder of flame, may be deflected and made to impinge upon it in a nearly horizontal direction, thereby increasing the intensity of combustion and the production of light, with the additional advantage of obtaining so much of the light of the flame below the deflector as was formerly hid and lost. The "*additional advantage,*" which forms the very soul of this patent (the ordinary mode of using a similar deflector being expressly disclaimed), seems to be of a very doubtful character, inasmuch as little, if any, *light producing combustion* takes place *below the deflector.*

Claim is made to three separate modes of accomplishing this object. 1. By means of a glass cylinder. 2. By a wire support upon an open frame. 3. By means of an expanding rim within a glass chimney. In the first case a short glass cylinder, rather smaller than the glass chimney, supports a horizontal metal deflector at the desired point; brass is preferred. In the second instance it is supported by wires rising from an open frame. In the third mode an open ring is employed, which, having a tendency to expand, presses upon the inside of the glass chimney, and thereby supports the deflector at the required height. If there were any real advantage in this arrangement, it has been most effectually superseded by giving the requisite form to the glass chimney itself, and so realising all the advantages sought for, without any additional appendage.

SIR JOSIAH JOHN GUEST, OF THE DOWLAIS IRON WORKS, GLAMORGAN, BARONET, AND THOMAS EVANS, OF THE SAME PLACE, AGENT, *for certain improvements in the manufacture of iron and other metals.* Rolls' Chapel Office, September 28th, 1840.

The improvements consist principally in the introduction of jets of steam into the puddling furnace while the iron is in the state usually called "fermentation." The success of the operation depends very much on bringing the steam in close contact with the melted iron, to effect which, wrought iron telescope tubes, sliding one on the other, are employed; the jet pipe being ¼ of an inch in diameter, and the steam pressure 15lbs. upon the inch. These tubes are raised or lowered according to the quantity of fluid metal in the furnace, by means of a suitable lever.

In the second place, jets of damp steam are introduced into the refining furnace, after the pig iron is melted, through the same apertures as the blast, the quantity and pressure of the steam being regulated by the quality of the metal acted upon. During this process, in order to keep the sides, bridge, and bottom of the furnace from burning, a quantity of steam is introduced upon the fluid cinders as soon as the heat is drawn, until the cinders become of the consistence of paste; this paste is then raked up against the back, sides, and bridge of the furnace, so as to fill up any cavity that may have been burned during the previous heat of iron. The use of cinders in this state keeps the iron quite clean and free from the dirt which always attend the use of clay and limestone. In this instance four jet pipes are used, ½ an inch in diameter, and steam of 20lbs. on the inch. The steam may be generated in a

tube or cylinder in the furnace chimney, or may be supplied from a regular steam boiler.

The employment of steam in a similar manner in melting the alloys of copper and iron, and iron and tin, is also claimed, but the particular application is stated to be to the manufacture of iron, whereby a better material is obtained with greater economy. The claim set forth is for the use or application of steam forced upon or into, or in contact with the melted iron in the refining or puddling furnaces for the manufacturing of the same; also for the similar use of steam in the process of melting or manufacturing alloys of copper and iron, and of tin and iron, in such furnaces; and lastly the application of steam to fluid cinders as described, to produce the paste aforesaid; and the use and application of the said paste.

John Bethell, of St. John's Hill, Wandsworth, Surrey, Gentleman, *for improvements in heating and preparing certain oils and fatty matters.* Rolls' Chapel Office, September 28th, 1840.

The object of these improvements is to render various animal and vegetable oils useful for lubricating machinery and for illumination, by precipitating a portion of their gelatinous, or albuminous matters, and when such oils are intended for burning, by adding thereto hydrocarbons, or essential oils. In the first process the common oil is thoroughly mixed with a solution of tannin, an infusion of gall-nuts in water being preferred, of which 10 gallons are employed to 100 gallons of oil; after standing three or four days, and all the tannin and precipitate matter has been thrown down, the clear oil is drawn off and mixed with a solution of acetate of lead, acetate of alumine, or sulphate of zinc. If acetate of lead is employed, the solution consists of 1 lb. of that salt to six gallons of water; if acetate of alumine, 1 lb. to four gallons of water; or if sulph. of zinc, 1 lb. to six gallons of water; 10 gallons of one of these solutions is to be used to each hundred gallons of oil; but the patentee does not confine himself to these proportions. This mixture should be kept at a temperature of about 70°. If the water should ultimately appear in excess, the mixture must be agitated with 10 per cent. of fresh calcined sulphate of lime in fine powder, and cleared by precipitation while at rest, or by filtering through oil-bags. In the second process, to the oil purified in the above manner, or to the most fluid parts of palm or cocoa nut oil, the patentee adds from 5 to 10 per cent. of any of the following essential oils, or hydrocarbons, viz.: petroleum, naphtha, fine oil of turpentine, or the best essential oil obtained from the distillation of coal tar, or the oil obtained by the distillation of any of the essential oils before named with palm or cocoa nut oil. The quantity added to be regulated by the kind of oil operated upon, and the inflammability required, varying from 5 to 10 per cent. The essential oil, or hydrocarbon is to be intimately combined with the bulk of oil, by agitation, or by passing the vapour of the essential oil into it by a Wolfe's apparatus, but the agitation is preferred. If from the original purity of the oil, or from so fine an oil not being wanted, it should not be necessary to employ both processes, one will be sufficient, the latter being preferred. For a superior burning oil both processes are preferred, but for a lubricating oil the first only is to be used.

The process for heating and preparing fatty matters, is as follows:—to any given quantity of "butter of palm," or rough palm oil, or other concrete vegetable oil, add about 20 per cent of essential oil; put the mixture into a common still, on the application of heat, the essential oil and the volatile portion of the palm or other oil will come over and may be used as before directed. Preference, however, is given to distillation by steam, in the following manner:—put the mixture into a close wooden vat furnished with a steam pipe from a boiler branching out into a series of perforated pipes at the bottom of the vat; the charging hole of the vat being closed, turn on the steam, when all the volatile products will be driven off and may be collected by a refrigerated worm in the usual manner, for use. The concrete fatty matter remaining in the vat is said to be left in a more useful state for many purposes to which it is applicable.

Henry Martin, of Morton-terrace, Camden Town, *for improvements in preparing surfaces of paper.*—Enrolment Office, September 30, 1840.

The processes constituting these improvements, as claimed, are fourfold, viz.: 1. The mode of preparing surfaces of paper by combining thereon a coating of oil paint, with subsequent embossing, as afterwards described. 2. The mode of preparing surfaces of paper in the manufacture of paper-hangings, by combining thereon a coating of oil paint, and afterwards printing or producing thereon the required pattern. 3. The mode of preparing surfaces of paper by combining thereon a coating of oil paint, and subsequently glazing or planishing the same. 4. The mode of producing a coating of oil paint on paper, by means of rollers. The paint used for this purpose is the same as ordinarily employed in house painting; a piece of paper of 12 yards, or other required length, is to be laid upon a table of similar dimensions, sized with one or two coats of common or superior size, and then painted with an ordinary brush; while yet wet, the surface is to be smoothed over with a dry brush, to take out the marks left by the first, and subsequently finished with a badger softener, which pre-

duces a smooth and level surface, so essential to the success of this process. In the other process, oil colour is laid on the surface of paper by passing it between two rollers, together with an endless felt; this felt in its revolution is supplied with oil colour by passing into a trough, and under a roller partly immersed in the colour; a scraper removes the superfluous colour as it rises, and levels and equalises the colour; the paper is passed through the rollers two or three times, according to the thickness of colour required. Paper thus prepared on the surface, may be embossed with engraved dies or rollers in the usual manner, or printed with blocks, &c., for paper hangings, which may be washed with soap and water when soiled. If marbled paper is to be produced, the colours are thrown upon water in the usual manner, the effect being increased by softening off before they are dry. If the surface is to be glazed or enamelled, the oil colour is thinned wholly with turpentine, as a flatting colour; when set, it is to be mounted on a woollen cloth, cotton velvet, or other firm soft bed, and smoothed over with a pallette knife, or trowel having a very smooth surface; when dry and hard, the polish may be heightened by any of the usual methods, which will produce a beautiful surface for copper-plate printing, paper hangings, and various other purposes.

STEAM-BOAT CHALLENGE FOR ONE THOUSAND GUINEAS.

Sir,—Seeing in your last Magazine the challenge of Mr. Smith to sail any common paddle-wheel steamer, &c., I enclose my answer to that challenge, as it appeared in the *Sun* paper of the 22nd ultimo, and shall thank you to insert it in this week's publication, knowing that it will be appreciated by many of your readers. Active measures are taking by my friends to prove the merits of the two plans. Your compliance will much oblige,

Your obedient servant,
JAMES LOWE, Patentee.

Wellington-street, Blackfriars-road,
October 1, 1840.

Steam Boat Challenge for One Thousand Guineas.

To the Editor of the Sun.

Sir,—My attention having been directed to the above challenge, which appeared in your paper of the 17th instant, I take the earliest opportunity of noticing it, and shall feel obliged by your inserting my reply, and *anxiety* to test the boasted merits of the *Entire Screw* of Mr. Smith, with *my patented improvements in propelling* by means of *curved blades*, or *segments of a screw*, upon which plan I have been experimenting during the last two years.

Mr. Smith knows perfectly well that there is no *paddle-wheel steamer in the kingdom* of the *exact power*, tonnage, and draught of water of the *Archimedes*, and consequently he *runs no risk of losing his money*; but, to give him a *chance of winning mine*, I agree that a trial shall take place in the *open sea*, over a distance of 100 or 500 miles, for the sum named by him, but *upon this plan*, viz.:—That the *Archimedes* shall be fitted with the *entire screw or worm, patented by Mr. Smith*, and the distance and time of performance noted by qualified persons, and appointed by each party, the *Archimedes* doing the distance *first*. That the screw shall then be removed, and the vessel fitted with my curved blades or segments of a screw; the expense of such alteration, together with all the incidental charges consequent on the trial, such as coals, wages of engineers, &c., to be defrayed by me. The alteration to my method may be effected in a few hours, by merely taking the screw from the shaft, and fitting *the segments*, which are so contrived as to be easily adjusted to any position or angle required.

By this plan the merits of the two inventions would be fairly tested, and the world would know whether Mr. Smith had overcome *at last* all the drawbacks and disadvantages which *all Patentees* of the Archimedian screw had been obliged to yield to, or for ever have to contend with.

If Mr. Smith thinks my proposal *one-sided*, or likely to throw a preponderating degree of risk and trouble on his part, in proportion to mine, I will (provided he complies with my proposition of the *Archimedes* making the trials) sail him *either* of the before-named distances, *Five* Hundred Guineas to *Four*, and thank him too.

N.B.—The trial to take place before the 15th October next.

I am, Sir, your obedient servant,
JAMES LOWE, Patentee.

No. 38, late 27, Wellington-street, Blackfriars-road,
September 21, 1840.

THE "FATHER THAMES" STEAMER.

Sir,—Hearing a great many reports of the high speed attained by the *Father Thames*, I took a trip to Gravesend, in order to satisfy myself as to their truth, and I found them to be perfectly correct. When we reached Blackwall the *Eclipse* was just starting, and by the time we were a quarter of a mile ahead she was at full speed. On nearing Gravesend it was very evident that the *Father Thames* had increased the distance between her and the *Eclipse* considerably. On asking permission to visit the engine-room, I was *not* refused, as your correspondent, "A Subscriber," says he was. I there found no attempt at concealment of any part of the machinery, but all "fair and above

board." Her engines are 35 horse-power each, and she has only one boiler, and not boilers, as stated by "A Subscriber." I certainly expected, from "A Subscriber's" account, to find much greater *vibration*. The rattling of the funnel proceeded from the arms used for lowering it striking the sides, and was easily prevented (while I was on board) by placing two pieces of wood between them and the funnel. This would have been occasioned by very slight *vibration*.

I am, Sir, your obedient servant,

T. D. S.

September 30, 1840.

THE "ECLIPSE" AND "FATHER THAMES" STEAMERS.

Sir,—The second letter of "A Subscriber" on the *Eclipse* steam-boat, at page 331, is upon the whole strikingly confirmatory of the account I transmitted you. His mode of guessing at the *pressure* by the *colour* of the steam, is vague and unsatisfactory, and I fear very wide of the truth; his *impression* gives it at 8 or 9 lbs. on the inch, but from the length of the steel-yard lever, I should put it down at considerably above 10 lbs. If it is not more than this, Mr. Napier can soon remove any injurious impression likely to arise from this supposition.

I beg to state, that I clearly understand the nature of *vibration*, and also the *shooting motion*—both of which are to be found abundantly in the *Eclipse*. As to which of the two is *most unpleasant* may be a matter of taste, and therefore "A Subscriber" is entitled to his own opinion. For my own part, I found the shooting motion exceedingly disagreeable; sitting abaft the cabin table, sipping Bohea, I kept making a series of "booings" to some ladies on either hand, who could not understand the involuntary noddings continually perpetrated by "the rude stranger," until an apology and explanation converted the annoyance into a ludicrous occasion of merriment. The motion is, as represented by "A Subscriber," that of a boat impelled by a pair of sculls; it is not, however, to anything like this extent, "common to all boats with *one* engine"; nor does it arise merely from the quicker motion of the engine after passing the centres. It arises from the great difference in velocity between the up and down strokes of the piston. The great weight of the *steeple*, and its various appurtenances, acts against the piston in its up stroke, and with it in the descent, giving so great an impetus and inequality to the motion of the paddles, as to produce the evil complained of.

With respect to the opinion I ventured as to the relative speed of the *Eclipse* and the *Father Thames*, my *supposition* has been fully realised, the latter vessel having beaten the *Eclipse* in a fair run to Gravesend, by four minutes.

"A Subscriber's" description of the *Father Thames* exhibits a sad specimen of *guess work;* he says, the "boilers" are "Spiller's" patent. There is *one boiler*, and that is *not* "Spiller's patent." The steam pressure is said to be about 8 lbs. on the inch, *it is under* 5 lbs.! Perhaps "the colour" has misled again! With respect to the rattle of the *funnel*, "A Subscriber" has also shown that he is either a very partial or a very careless observer; and as to the shaking of the cabin tables, ditto.

The *Father Thames* was, I believe, hurried on to the station to relieve its *Sons*, without receiving that attention to minor points which a little practical experience soon sets right. But I fancy "A Subscriber" may now take another trip, if his humour wills, in "the fastest packet in the world," and escape those several disagreeables which he oddly enough stumbled upon in his last excursion.

I am, Sir, your very obliged servant,

CANDIDUS.

Margate, Sept. 29, 1840.

NOTES AND NOTICES.

Cornish Engines.—A deputation from the Dutch government having visited Cornwall in order to ascertain by actual inspection whether the duty performed by the steam-engines employed in the mines is equal to what is stated in the monthly reports, the adventurers and agents of the undermentioned mines kindly permitted an experiment of six hours to be made on their several machines, and the duty as stated below was the result:—Wheal Vor, Borlase's engine, 80 inches single, 8 feet stroke, 123,300,593 lb. lifted one foot; Fowey Consols, Austen's engine, 80 inches single, 9 feet stroke, 122,731,706 lb. lifted one foot; Wheal Darlington engine, 80 inches single, 8 feet stroke, 78,257,765 lb. lifted one foot; Charlestown United Mines, 50 inches single, 7 feet 5 inches stroke, 55,912,392 lb. lifted one foot; Charlestown United Mines, stamping engine, 32 inches single, lifting 66 stamps, 60,525,000 lb. lifted one foot; Wheal Vor stamping engine, 36 in. double, lifting 72 stamps, 50,085,000 lb. The number of pumping engines reported this month is 55. They have consumed 3,730 tons of coal, and lifted 36,000,000 tuns of water 10 fathoms high. The average duty of the whole is, therefore, 54,500,000 lb. lifted one foot high by the consumption of a bushel of coal.—*Lean's Reporter.*

Ascent of the Nassau Balloon.—On Tuesday afternoon, at three o'clock, Mr. Charles Green, made his 278th ascent, in the Nassau Balloon, from the spacious grounds of the Commercial Gas Company, at Stepney; accompanied by Mr. Isaac Mercer the engineer to the company, and three other gentlemen. Free access to the grounds, was most liberally given to the respectable inhabitants of the vicinity, of which a large assemblage availed themselves, while the locality around afforded an uninterrupted view to a still larger multitude. Nothing could exceed the propitious state of the weather, the sun was shining brightly, amid an almost perfect calm. When loosed from the ties which held it to the earth, the ponderous machine with its intrepid voyagers, rose majestically in an almost vertical direction; on attaining a considerable elevation it took a southerly direction, but soon entered an opposite current, which caused it to retrace its steps and again hover over the spot which it had just quitted. After thus remaining in sight for about half an hour, the balloon veered to the south east, and it is presumed fell somewhere in the county of Kent.

W. B.

LONDON: Edited, Printed and Published by J. C. Robertson, at the Mechanics' Magazine Office, No. 166, Fleet-street.—Sold by W. and A. Galignani, Rue Vivienne, Paris.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 897.] SATURDAY, OCTOBER 17, 1840. [Price 3d.

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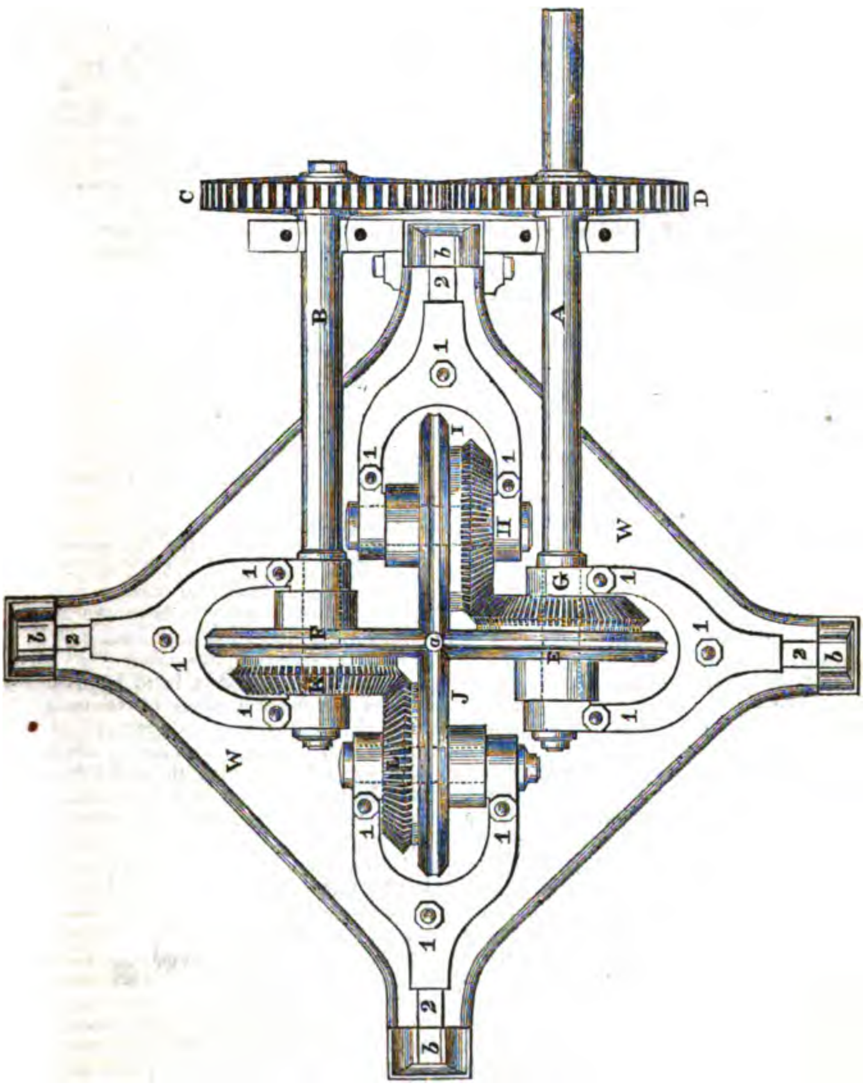
PROSSER'S IMPROVED MACHINERY FOR MANUFACTURING PIPES.



The process of manufacturing metal pipes by passing them between a pair of grooved rollers is of some standing; the use of such rollers for this purpose, was the subject of a patent granted to Mr. Wilkinson in, or about the year 1790, for making lead pipes; the subsequent application of this principle to the bending up and welding of iron pipes, was patented by Mr. Osborn in 1817.

It has been observed, however, in working, that the pressure is not in this case applied uniformly to the whole circumference of the pipe: the compression, when the rollers are placed one above the other being very great upon the upper and under surfaces—and very slight laterally, *i. e.* upon the two sides of the pipe.

In order to obviate this practical difficulty, Mr. Richard Prosser, civil engineer, Birmingham, has recently patented "certain improvements in machinery or apparatus for manufacturing pipes," in which he ingeniously employs two pairs of grooved rollers, working in combination, so as to cause an equal and uniform pressure to be given around the whole circumference of the pipe. The manner in which this is accomplished will be understood on reference to the engraving on our front page, which is a vertical front elevation of this portion of the apparatus. A and B are two axes placed horizontally one above the other; motion being given to one, is communicated to the other by the two equal spur wheels C and D. E and F are two circular wheels upon the axes A B respectively, having a concave groove around the circumference of each. I J are two similar wheels, also furnished with concave grooves on their circumferences, like the former. The wheels I J are both placed in the same horizontal plane with their concave grooves corresponding, so as to form a second or additional pair of revolving grooved rollers, and with the former completing the circumference of the circle *a*, corresponding in size to the pipe required to be made. The requisite motion is communicated to the two wheels I J, by means of the bevil wheels K L, the teeth of which gear into similar bevil wheels G H. All the wheels being of equal size, the motion of the grooved circumferences of the four rollers which receive the pipe between them will be exactly alike, and their uniform motion and pressure will have the effect of compressing the metal pipe above, below, and on each side, at the same time.

The edges of the rollers I, J, E and F, are bevilled, so that the circumference of all the four wheels are closely in contact with each other all the way round the pipe *a*, as shown in the drawing; the concave grooves being each one fourth of a circle of the same diameter as the pipe required, all four of the grooves, will between them, leave a circular space or passage *a*, which is exactly adapted to receive the pipe, so as by rolling it through to compress the metal on all sides as before explained. This is supposing the pipe is required to be of the usual cylindrical form, but by a suitable modification of the grooves, an oval or any other figure may be just as easily produced, by similar equal and uniform pressure.

The bearings 1, 1, 1, for the pivots or gudgeons of each axis may be forked as represented in the drawing, to include each wheel or roller E F and I J between two of the said bearings, and each forked piece may be fastened by three or more screws against the flat surface of the fixed framing W, but with a little liberty of adjustment by means of wedges 2, inserted between the ends of the several forked pieces and prominent parts (*b b*) of the frame.

When this apparatus is to be used for making welded pipes of wrought iron, the iron should be prepared by rolling into thin narrow plates or strips of suitable length, breadth, and thickness, in the usual manner of what are called "skelps." About 8 or 10 inches at one end of such strip is bent or turned up, approximating to the form of the intended pipe—the two edges of the iron being made to meet each other. The strips of iron so prepared are heated in a reverberatory or other furnace to a welding heat, and the bent up end introduced into the passage *a* between the four revolving rollers, which, seizing hold of it, compresses the iron so as to bring the edges of the iron into close contact, whereby the welding is effected. As the iron moves forward through the

rollers, that portion of the strip that was left flat becomes, as it approaches the rollers, bent up, rounded, and welded. Or, if preferred, the whole length of the skelp may be bent up into a gutter or groove by means of a tool known in the trade as "the crocodile," previous to inserting it between the rollers. In connection with the grooved rollers, a fixed mandril is employed, of the size which is to be given to the pipe internally, the effect of which is to support the pipe under compression, to render it smooth on the inside as well as outside, and to ensure uniformity of bore throughout.

Mr. Prosser proposes to use two or three of these machines, in combination, one before the other: the circle formed by the grooves in the second set being smaller than that of the first, and the third smaller than the second; the pipe passing through these diminishing apertures is gradually compressed, by which means the edges are more effectually welded, and the pipe rendered more perfect. If a curved pipe is required, curves of any convexity may be produced by placing the machines in a circular position, and passing the skelp through in the usual manner.

THE "ARCHIMEDES" *v.* THE "WILLIAM GUNSTON."

Sir,—I observed in No. 895 of the *Mechanics' Magazine*, some remarks by Mr. Christopher Claxton, relative to the trial of strength between the *William Gunston* and the *Archimedes* steamers, and I was surprised that Mr. Claxton should deny the fact of the *Archimedes* towing the *William Gunston*: as the former towed the latter three times across the river. During this towing, the engines of the *William Gunston* were at rest, but when in motion, although she had to tow against the stern way given to her by the *Archimedes*, she very soon stopped the way of that vessel, and then dragged her astern. Mr. Claxton observes, that the trial only lasted "ten minutes;" if so, as the *Archimedes* towed the *William Gunston* three times across the river, the latter must have towed back the former at a very quick rate indeed, the distance being about three or four hundred yards. The same gentleman observes, that it was a matter of doubt for some time, whether the *William Gunston* would tow her or not. I deny this, unless he means before the engines of the *Gunston* were set in motion; for, as I have before observed, she very soon brought the *Archimedes* up.

With respect to the pressure of the steam on the *William Gunston*, it is the same now as when she left the manufactory; the safety valve being so constructed, that the engineer has no power to add to the pressure. If the diameter of the cylinders of the *Archimedes* is, as stated in the Magazine, 36 inches in diameter, those of the *William Gunston* being only 27 inches each, there will, I am afraid, be some trouble in making out that "the *Gunston's* power proved considerably superior to that of the *Archimedes*." I had no concern whatever in the article complained of by Mr. Claxton, but if "the whole truth and nothing but the truth," is to be told, I flatly deny Mr. Claxton's assertion, namely—that "*the Archimedes never towed the William Gunston;*" for I distinctly state *that she towed her three times across the river.*

I am, Sir, your obedient servant,

JOSEPH BLACKBURN,
Engineer of the *William Gunston.*

October 15, 1840.

RAILROAD ACCIDENTS.

Sir,—Although I am not a thick and thin advocate for railroads as now applied and conducted, still I cannot help feeling great pain at the recitals of the numerous fatal and injurious accidents which continually occur on the lines. Many suggestions are given by the public papers to give security, none of them of a mechanical and positive nature, but all only depending upon a greater degree of attention, or, as the French call it, *surveillance* of the people employed upon the lines. This is but a flimsy protection to the travellers, maugre all good intentions and intended diligence on the part of the railroad directors, engineers, and their servants. I have watched their conduct very closely on several lines, and I must say that zeal and caution predominate in all they do, as far as *I* have seen. One case I must allude to, and that was of a young man cut in

twain on the Croydon line, by reason of an error of management, on which I had twice written in the public papers, but unheeded.

A train of "*ballast*" waggons, full of earth, is drawn to a certain point, then emptied. Well and good; but when they are taken back again *empty*, the engine's action is reversed, and the *empty* train is *pushed* before it at an enormous speed. On coming to a curve it is quite evident that the train, attached together in loose connections for *tractile* action, is liable to be pushed off the rails. This I saw happen on the Croydon line, with loss of life. I know of other cases in the north, but which it might be thought invidious for me to publish. The theory of this error is just like unto a man *pulling* a rope behind him; if he were to attempt to *push* it before him, it surely would not follow, or rather take, a straight line. Such is the case with an engine *pushing* a train, and especially an *empty* one, *before* it. Several fatal accidents have occurred from this practice. But the main object of this note is to draw your attention to the communication of one of your numerous correspondents, I think about two years ago, which your index will point out, of a frame for steam railroad engines and carriages, which, at the time, struck me as being so constructed as to render their going off the rails impossible.*

I have the honour to be, with high esteem,

Sir, your obedient, sincere, &c.

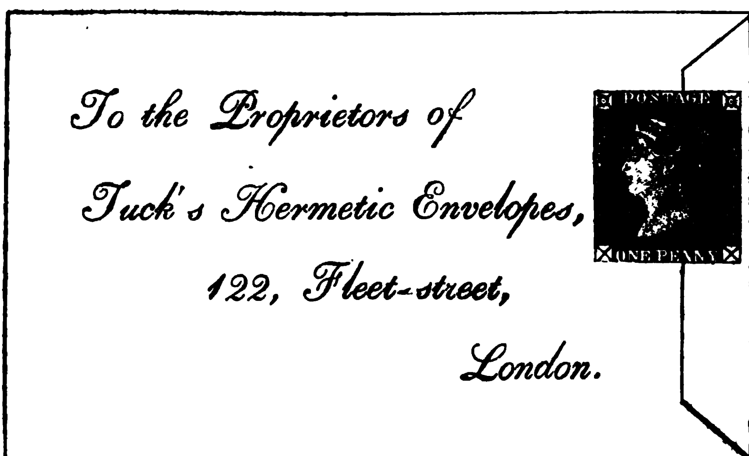
MACERONI.

P.S.—I have not treated on the propriety of increasing the flanges of the rails and wheels.

1, St. Martin's-place, Trafalgar-square,
30th Sept. 1840.

TUCK'S HERMETIC ENVELOPES.

(Registered pursuant to Act of Parliament.)



Among other consequences that have grown out of the new postage system, is the universal employment of envelopes, which have now become almost essential to all polite or official correspondence. A writer in a late number of the *Quarterly Review*, alluding to the employment of envelopes, observes they "are very popular, particularly with the higher and middle classes, because it is the fashion, and a mark of *bon ton* to enclose one's letter in an envelope. A scheme, there-

* We have not been able to identify the communication alluded to.

fore, that enables all to indulge in this little aristocratic convenience, is pretty generally acceptable: an envelope is, besides, more easily sealed and more secure when properly sealed." One evil attending their employment, however, has been the great facility with which access may be obtained to the interior without detection, thus permitting the over-curious or the dishonest to rifle the enclosure of its secret, or its pelf. The writer already quoted, observes that "the corners now in use are generally *very unsafe*—nothing can be so easy as to detach one of the folds, extract the letter, read and replace it, without any possibility of detection." The injury which has been occasioned by family secrets transpiring in this manner, is of the most distressing kind; much worse, in fact, than the consequences of fraud and dishonesty in abstracting matters of more intrinsic value.

These evils were no sooner made apparent, however, than ingenuity was excited to produce an antidote, and an effectual one was the result. We have much pleasure in giving the testimony of our experience (some months') to the convenience and security afforded by the Hermetic Envelope, of which the prefixed is a representation, and which our readers will perceive is on an entirely novel and original plan. The title "Hermetic," though not strictly correct, is nevertheless an appropriate one, pointing out as it does the peculiar and meritorious character of the invention. When once sealed, this envelope forms an impenetrable depository for all kinds of correspondence (actual force always excepted, from which no letter of any sort can be exempt). There is but one flap, and that is only to be slipped aside by breaking the seal. For the enclosure of bills of exchange, confidential communications, legal and official documents, &c., this envelope must, we think, be invaluable.

A. M. Skene, Esq., of Durham, lately wrote to Colonel Maberly, suggesting that the postage stamps should be used as seals, to which he received the following reply:—

"General Post Office, Sept. 20th, 1840.

"Sir,—In answer to your letter of the 20th inst., I beg to inform you, that if the postage stamps are placed on the backs of the letters, as you propose, it is impossible to prevent their being charged with postage, in the haste and pressure under which all the business of the Post-office must be discharged.

"James Campbell,
"For the Secretary.

"To A. M. Skene, Esq."

Now, "Tuck's Hermetic Envelopes" completely meet the views of this gentleman, as in them the postage label is made to serve the double purpose of *sealing* and *franking* the letter; thereby superseding the use of wax or wafer for all ordinary purposes. The way in which this is accomplished will be at once apparent from the accompanying sketch. The postage label being previously attached to the flap of the envelope, when the letter is inserted, it is only to moisten the paper, press down the label, supply the direction, and it is ready for posting. When further security is required, a wafer or wax may be added. The form of this envelope affords a degree of security as well as convenience and facility in despatching, possessed by no other, and which strongly commends it to public favour and patronage.

REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS APPOINTED 7th FEB. 1840, TO ENQUIRE INTO THE EXPEDIENCY OF EXTENDING COPYRIGHT OF DESIGNS.

(Continued from page 380.)

Mr. James Kershaw, is a calico printer at Manchester, a partner in the firm of Leese, Kershaw and Co. Has been in that business from 18 to 20 years; is an Alderman of the town of Manchester, and a magistrate of Lancashire. They have print works at Ardwick, near Manchester. Employ their own designers; at present they have five, but sometimes have six. They purchase patterns besides those obtained from their own designers. As near as he can calculate, should say, that 500*l.* a year is the expense of production of designs by their own designers, and about 100*l.* a year for those they purchase from persons who offer them in the trade. They produce about 1,200 patterns in the year from their own designers, and may purchase about 300, Of these they actually engrave but about 400. Cannot say exactly how many of each, because they do not print so many in proportion of those they purchase, as they do of their own production, because they have not the same confidence in their being original, or comparatively original, or original in the common acceptation of the term among calico printers. Has made a particular calculation, and included in it some trifling expenses which are incurred for the

purchase of French and cloth patterns, and other expenses in what is called putting on, or preparing for engraving; including all those expenses, he makes the patterns produced by their own designers, and those purchased from others, to cost as near as possible 8*s.* a pattern. This does not include the expense of engraving. After a nice calculation, they find the engraving of their designs cost upon an average 6*l.* per pattern; taking the average of colours, whether they be single colours, two, three, or four colours, 6*l.* per pattern will cover the expense of engraving. Thinks it is exceedingly difficult to decide what are new and original patterns; thinks it almost impossible. When we consider the millions of patterns that have been produced during the existence of the copyright, that their approximation to each other is so exceedingly near, and that they have run through a period of nearly half a century, and that no registration has existed to enable us to know what has gone before, all these circumstances render it, as it appears to him, a matter of impossibility to ascertain whether a pattern is new and original. Believes the judges of patterns in general might be mistaken in point of originality. Receives French patterns regularly; the higher class printers, he thinks receive them universally. One of the most successful, one of the most extensive calico printers told him at a dinner table, at which there were other parties present, that he very seldom did anything at his works but French patterns, and he believes they form the staple of the trade with regard to first-class houses; and he infers, therefore, that they are greater copyists, not of unprotected patterns, but greater copyists in another sense than any other portion of the trade. And it is that best class of printers that are now seeking extended protection, generally; they have a few others with them, but decidedly the first-class printers are those who are seeking the protection, whilst the medium, and lowest class of printers are almost universally against it. The majority in number of the whole trade are decidedly against it, as proved by the petition, but generally speaking, that class of manufacturers, who produce some of the finest textures are in favour of the extension of the copyright. In regard to the number of printers, the majority is against it; and with regard to the production, decidedly against it, both in value and amount. Witness is not of opinion that the character of the art of designing in this country will be promoted by the extension of the copyright. Thinks it will be best promoted by competition, and thinks the designers will get a better reward for their labour by open competition than by a further protection of the copyright. The public undoubtedly will be best served by competition; monopoly, to his mind, means high prices, and he thinks the obvious tendency of giving protection for twelve months to patterns of so slight a value on the one hand, and of so ephemeral a character on the other, will tend to create high prices, consequently injure the public, lessen the competition for designs, and therefore lessen the quantity required, and will also tend to diminish the quantity of engraving, and will, in fact, injure the trade very seriously. He considers that competition produces abundant supply at the lowest remunerating price. His patterns have frequently been copied, they have been copied during the present spring; did not complain of his print being copied; wishes they would copy him more frequently, should then fancy he was bringing out something worth copying. Has never spent a farthing in the protection of his patterns, and hopes he shall never do so. A large class of persons obtain their living by the production and sale of designs, and thinks an extended copyright would injure them. Upon the whole, is of opinion that the extension of the term of copyright would operate most injuriously to the interests of both the trade and the public. Believes that competition and free trade will best serve all parties connected with it, as well as the public. Thinks decidedly, that if parliament should decide upon granting an extension of copyright, it should be accompanied by a registry; indeed he thinks it would be an improvement, if there was no extension, if a registry was instituted, it it could be worked satisfactorily. The registry should be open unquestionably, that parties may be warned against the commission of the offence. At present they may offend against the law without knowing it, or without intending it; and thinks there ought to be an open registry, with a deposit of a pattern, and that that deposit of a pattern being in the nature of an injunction to the public not to vend it, should be accompanied with an affidavit or declaration that such pattern is original, otherwise patterns might be entered which are not original, and the public by that means led astray in the matter. Should not be induced, if the copyright protection was extended to 12 months, to employ more designers than at present; does not see that he should have any occasion for more; is of opinion that he should rather have occasion for less; believes his trade would be lessened, especially during the operation of the first few years, and that he should employ less designers consequently. Should not be induced, if the protection were extended, to give any more attention to the quality of the design. Does not see how he could; endeavours to excel at present; has

every inducement at present, because the success of his trade depends upon it. Though his designs are not of the most superior class, he thinks them the most suited, so far as his markets are concerned, he deals extensively with London and Dublin and Glasgow, as well as with all the foreigners; therefore, although he does not produce the very high-priced prints, yet the great quantity of sales shows that his designs are adapted to those markets, at all events.

Mr. Daniel Lee, of the firm of Wright and Lee, is engaged in the calico printing trade, as a seller; has no works. Resides in the neighbourhood of Manchester, and is a magistrate in that borough. Has the print department under his own immediate superintendance. Has no works of his own, but employs some works exclusively, and others in part; by employing some in part means that those works produce prints for other parties besides. Such houses do not produce similar styles and patterns for other parties; he limits them to his own patterns for himself only. The great majority of his patterns are supplied by himself, and others are patterns which the printers supply and he adopts and makes them his own, thereby obtaining the exclusive use of them. Comparatively, those patterns form a very small portion of his trade. He employs six designers constantly, and frequently eight, who are paid so much per pattern for all the patterns they produce, whether adopted or not. Occasionally he purchases patterns from designers who work for the trade generally. The total number of designs produced for him, and purchased in the course of a year, is about 3,000. Those produced for him being about 2,500, and those purchased about 750, speaking in round numbers. Considers the pattern designing to cost his firm about 1000*l.* a year. He never copies the patterns of other houses; during the thirty-five years his house has existed in Manchester, that has been its character, that it has never copied patterns produced by others. All the patterns so produced are properly termed by the trade original designs, and such as the Court of Chancery would confirm his exclusive right to. Never copies the patterns of others, when the copyright has expired; has a great objection to copying—does not copy French patterns. Of the 2,500 patterns produced, supposes he actually engraves rather above 600 a year. Cuts very few of the purchased patterns; buys them merely for ideas, does not feel safe in cutting them. The total production of his concern per annum in prints is about 700,000 pieces; thinks that is about the average for the last five or six years. Considers that the sale of 500 pieces of each pattern is amply sufficient to remunerate him, and also the printer, for the cost and labour and risk of production; if he could always ensure the sale of 500 pieces he should be quite satisfied. Does not sell anything like 500 of every pattern he produces. Those which do not run so far he considers less successful, and such as go beyond that are unusually successful. When producing a pattern he feels a considerable degree of confidence; he generally has an impression that it will be successful. Does not act to any great extent upon his own favourable opinion; in the first instance he gets up about 50 pieces as a sample and then waits for further orders. Never, from relying on the success of the pattern, ventures in the first instance to print 500 pieces, unless there is a positive order. Is not in the habit of exporting goods, but deals largely with those who do. Deals with parties who are connected with almost every market with which England deals in the four quarters of the globe. Should say so, but it is generally through agents, and he does not know where they send their goods; he does not want to know, and probably if he did, they would not tell him. Has never protected any of his prints under the existing copyright act. A large proportion of his goods are what are called "Navy Blues." Never knew any printer to protect a navy blue. The cloth and colour are not all that is valuable in them; the design is a very great consideration. The navy blues are not the lowest class of productions; there are much lower goods than blues; low spirit plates are of a more common quality. There are even in the production of navy blues a great variety of patterns, notwithstanding the ground may be all of one colour; it is of considerable importance. Of so much importance, that had he considered it worth while to protect his patterns generally, he would have protected these. If he attached any importance to the protection, it would have been very important to protect his blue patterns. It has never formed any objection with his buyers, that his prints were not published, and therefore not protected: never heard it named or alluded to. Has never been asked the question as to whether his patterns were or were not protected. He does not publish according to the Act, so that every one can know that he does not protect them. He puts the name upon every piece. Does not think the amount of his sales any less than it would have been had his goods been protected. Does not think it desirable or necessary to protect his prints, because he does not mind being copied. Has been copied, and he does away with the supposed injury by keeping a constant succession of new prints coming round; and by that means does away the damage, if there is any, but cannot conceive there is any. Does not wait till he has sold 400 or 500

pieces of a pattern before bringing out a new pattern of a similar class, but brings out new patterns every week; and sometimes frequently in the week has had his patterns copied. Some branches of his trade are entirely foreign, and he frequently produces patterns expressly for that; but it also happens that a great number of his home trade patterns suit the foreign markets; should say that he does not produce quite so many, generally speaking, for the foreign as for the home; but contrives them to suit as many markets as possible. Has been copied in the prints prepared for the shipping trade. Has been copied within the term of protection given by law if he had chosen to avail himself of it, and in some of his most expensive patterns. He never complained to the parties; never took any notice of it at all; did not mind it, because his profits were moderate, and he did not fear, knowing that his means of production were fully equal to theirs, therefore he did not mind them, and never made a complaint. Is not always aware of being copied, and does not take any trouble to ascertain the fact. He had three or four patterns of furniture a little while ago, which were copied, and his customers told him of them; he should never have heard of it perhaps had it not been for them; but does not think it interfered with him; he took no notice of them, because he keeps such a succession of patterns coming round that he does not mind it in fact. From the indifference he has manifested on the subject of being copied, it is a fair inference that the copiers have not been able to compete successfully with him. Has never been able to perceive that his sales were affected by the copying. Is of opinion, that because he sells his goods at a moderate profit, the copiers have not been able to compete with him successfully; and they might also find a fresh connexion without interfering with him, and which might have been lost to the trade generally had they not done as they did in copying. Thinks decidedly that to produce and to sell at a moderate profit, is a better protection to the individual than a parliamentary guarantee or a pattern copyright. Has heard very little of copying, never so much as since he came to London on this business. There is not a great deal of copying in the trade. Is sure that his position in the trade is such that copying could not take place to any extent, without his being aware of it; because he sees so many customers that he should be sure to hear of it. Thinks one of their greatest difficulties is to determine whether the pattern is original or not; the patterns which are now produced, are for the most part, merely a combination of ideas derived from early patterns; patterns which have existed before; old objects re-arranged in which there cannot be any originality; there may be a little novelty of arrangement, that is all. There is a great practical difficulty even to a person well acquainted with the trade, in distinguishing a new pattern from an old one. Thinks there would be difficulty to find two persons to agree upon the subject. Should have immense difficulty in deciding himself, and fancies that his experience in these matters is pretty nearly equal to that of most. Has not had a great many patterns copied; does not think he ever saw any of his patterns copied. Thinks there is a difference between original designs and copies, but that old objects arranged in a different form, decidedly does not constitute new and original patterns; they cannot be new and original unless the objects be original. Imagines that if the term of copyright was extended to 12 months, the proprietors of such patterns could not avail themselves of the protection, inasmuch as they could not make the necessary affidavit that they were new and original designs; does not know what they might do—he could not. Does not know whether the opinion he entertains regarding what are originals and what are copies, is the opinion of the rest of the trade; he only gives his own ideas upon the subject. Cannot tell what is meant by "copy;" that is one great difficulty; does not know what "copy" means exactly, a *fac simile* is a copy, and an imitation is a copy; has the authority of Johnson for that, who is a very good authority as to the meaning of the word "copy." On Friday last he called upon one of the most extensive merchants in Manchester, and had a very long discussion on this subject, and he thought that those who advocated the extended protection, were merely going for *fac similes* being copies. He said "if any thing beyond a *fac simile* be called a copy I will go with you at once." This merchant belonged to one of the largest shipping houses in Manchester. An "imitation," as distinguished from "copy," must be something coming very near the original, but how near, he does not know how to define. Has never known any practical inconvenience to arise from any difficulty before a legal tribunal, or any other, in deciding between a copy and an original. Is of opinion, that were the term of copyright extended, there might then arise difficulties in the maintenance of copyright which have not heretofore existed, or which, if they have existed, have not induced the parties to come into court to seek legal redress. Thinks decidedly that the extension of copyright would bring many cases before the public that now do not appear. Considers that extra protection means extra profit, and he considers that it would

be better worth the while of any house to commence proceedings for a twelve months' copyright than it would be for a three months' protection. If the extension of copyright to 12 months took place, he should perhaps, avail himself of it like his neighbours, but is of opinion it would be a most injurious law to the trade generally. That has always been his opinion. Believes he has stated to parties in Manchester that it would be an advantage of 3,000*l.* or 5,000*l.* a year to him if it did pass. But thinks we should experience a corresponding injury in England by not being permitted to copy, while foreigners would be at liberty to do so; and though they do not copy as much now, still he thinks the advantage they would then derive from it would be so great an inducement, that if the proposed alteration of the law was made, it would become a decided trade with them to copy all our best prints, and pour them into the markets which we at present supply. Thinks that in the course of time, this copying by foreigners would take his trade entirely away, and therefore would rather sacrifice the supposed present advantage of 3,000*l.* or 5,000*l.* a year, than lose the whole trade hereafter. His apprehension applies decidedly not to the home, but to the foreign trade. Has stated that if the copyright were extended to 12 months, it would be a probable gain to his house; by taking advantage of that law he should expect to get as good a profit as his neighbours, on his styles (patterns); but the trade in his opinion would gradually fall off, so that the 3,000*l.* or 5,000*l.* would very soon be eaten up by the loss arising from the diminution of trade. Is of opinion that an extended copyright in designs would not benefit the class of individuals known in the trade as designers. Considers that the art of designing is much higher than it was seven years ago, and that it is at present improving. Thinks the best mode of extending and improving that art, is by having as free and open a competition in the article as you can; thinks under such circumstances the best and most talented man will command the best prices, and will take more pains to execute good designs, and he will take care, as far as he can, that every design shall excel the former one, knowing that an inferior design, will be of no use. There is a large class of designers in Manchester and the neighbourhood; it is a difficult matter to ascertain the exact number, but he should think there are about five hundred in Manchester and the district around. Thinks in the event of an extended copyright, they would all try to work their patterns 12 months; instead of three months, they should try to work them the whole of the time, and by that means there would be less occasion for so many designers, and consequently a great number would be thrown out of employment. That is, if he could make a pattern endure for a longer period than at present, he would require fewer designs would require less assistance in the production of designs from those parties, whose business it is now to produce them in larger quantities. Should state that to be the case not merely with reference to himself, but in the aggregate; thinks it must be so, for it affects one as well as another. There is a great degree of labour necessary in copying minutely; should say that tracing a pattern for a copy is a more tedious and unpleasant operation than designing an original as it is called. Considers that the extra time required to copy a pattern so minutely as to produce a *fac simile*, would be such as to render the production of the copy equally as expensive as the original design, and it might be more so. The confidence with which he deals with designers will unquestionably be in proportion to the freedom of the trade. Should say even now he has great difficulty, in fact he cuts very few of the purchased patterns, fearing the difficulties he might get into; but if the copyright were extended, he should seldom cut a pattern from any designer unless he had every confidence that there was something he could depend on. He alludes to patterns purchased from the open trade—those who live by going from house to house selling patterns, of which there are a very large number in Manchester. Should think that the present designers, of whom there may be about 500, would produce upon the average 20 patterns a-week each; that would be half a million, in round numbers, in the year. Goes from the calculation he makes of his own designers in this estimate. The printing trade is of growing importance; thinks it is growing in the number of pieces of prints actually produced. They had a considerable depression for some time back, which is not to be taken as a criterion of the trade; leaving that out, thinks the print trade is healthy and increasing. Is of opinion that an extended copyright would not benefit the public; thinks there is no doubt—inasmuch as monopoly or protection means an extra profit—the public would have to pay dearer for what they purchase than they do now; therefore the public would be sufferers. There would not be a free competition to bring down the profits to the scale which belongs to other business. It is true there would be competition as to style, and competition in every respect, except as to the specific pattern for which the twelve months' protection was granted. But thinks, inasmuch as there would be more protection, the public would

be worse served. The printer would have a longer time to reap the benefit of the protection. Conceives that an extended copyright would injure our foreign trade; in the first place, by giving the foreigners a decided advantage over us, in permitting them to copy, and us not; it is tying our hands behind our backs completely, and giving them full liberty to use our patterns as they please; we already hear of considerable interference with our goods in different markets. Presumes there will be an extra price if there is an extra protection, and that will enable the foreigner to compete much more easily with us than he is doing even now. Should say that the printing trade differs widely from many other branches of trade; for instance, the spinning trade; a person there does not require taste or skill, if he gets his mill, and gets a few persons to manage it, and so on; but the printer must have taste—he must have skill. There are many things required in the print trade which are not required in other trades, in order to ensure success; has not known a single instance where those requisites have been combined, in which they have been otherwise than fortunate. Should say that in every instance of failure it can be traced to a deficiency of means, of taste, or of skill.

(To be continued.)

DR. LARDNER DEFENDED FROM TREBOR VALENTINE'S MIS-READING.

Sir,—A correspondent under the above signature, in No. 893, *Mech. Mag.*, quotes (for the purpose of proving its incorrectness) a paragraph from page 7 of Dr. Lardner's "Steam Engine Illustrated," the latter clause of which Trebor Valentine makes to run thus—"this double journey of 190 miles is effected by the mechanical force produced in the combustion of *a quarter of a ton* of coke, the value of which is *six shillings*."

On referring to Dr. Lardner's work, I find he says, "this double journey of 190 miles is effected by the combustion of *four tons* of coke of the value of about *five pounds*."

Now, as Trebor Valentine acknowledged he had the book open before him at the very page from which he mis-quotes, he must be guilty of *wilfully mistaking* what the Dr. says, or else he is a most careless critic.

Yours, &c.

VULCAN.

Brighton, Oct. 6, 1840.

YSTALYFERA ANTHRACITE IRON.

A series of experiments have recently been made at Messrs. Whitworth and Co.'s works by Mr. Richard Evans, Manchester, upon the strength and other properties of the Anthracite irons of the Ystalyfera Company, with a view to ascertain their properties in relation to other irons. In submitting the results of about 280 experiments upon rectangular transverse bars, Mr. Evans modestly observes, "I trust that they may be considered rather as a series of elementary experiments upon a metal now so much occupying the attention of scientific and practical men, and a beginning to be continued and compared by abler investigators."

Mr. Evans has judiciously adopted the methodical arrangement of Messrs. Fairbairn and Hodgkinson, as being in all respects the most satisfactory, and where comparisons are made he has estimated the qualities of the Anthracite iron by their results.*

The trials were confined to the transverse strength of one-inch rectangular bars, with their several values, as under:—1st, specific gravity; 2nd, modulus of elasticity; 3rd, transverse strength of one-inch rectangular bars, 4 feet 6 inches apart; 4th, transverse strength of one-inch rectangular bars, 2 feet 3 inches apart;† 5th, ultimate deflection; 6th, power to resist impact, of which the tables are divided into, and contain bars broken from

72 specimens of No. 1,
65 ditto of No. 2,
61 ditto of No. 3,

all cast horizontally in sand, melted by coke from the cupola in the usual way; 44 specimens of bars melted as above, of equal mixtures of Nos. 1, 2, and 3; 24 specimens ditto, of the same melting and mixture, but afterwards planed down to a perfect one-inch square gauge; and 16 specimens ditto, of the same mixture, but melted in the crucible.

The melting furnaces were carefully cleared out, previous to the iron being put in, and the workmen enjoined to proceed with *care* in the casting, at the same time not employing any other than the usual method of melting, &c., so as not to disturb the ordinary condition or routine of iron casting. The bars were then well cleaned of the sand, and broken upon strong cast-iron standards, with a weight holder, fitted up especially for the purpose; and as evidence of the solidity, &c., of the whole, when the *distances* were carefully measured at the terminations of the experiments, *no* difference could be detected. The weights also were adjusted previous to use, with a sufficient quantity of small ones prepared, such as one, two, and three pounds, being essential to accurate results; and it

* Published in the sixth report of the British Association.

† The 2 ft. 3 in. bars are reduced to 4 ft. 6 in., as being a fair method of btaining a more correct mean; a separate column in the tabulated form being set apart for them.

will be as well to state, that many of the fractures were made with weights not exceeding these sizes, frequently with one pound, which enabled the experimenter to mark the ultimate deflections of some of the bars with a load approaching very near to the absolute breaking weight.

The following table comprises a summary of all the experiments made by Mr. Evans on the different kinds and conditions of Anthracite iron, together with those of other irons from Messrs. Fairbairn and Hodgkinson's list:—

Summary and Comparison of the Total Mean Results from all the Tables, together with the same from Messrs. Fairbairn and Hodgkinson's List.

Number of experiments 4 ft. 6 in. between supports, and 2 ft. 3 in. bars, reduced, to 4 ft. 6 in.	Specific gravity.	Modules of elasticity in lbs. per square inch, or stiffness.	Breaking weight in lbs. of bars, 4 ft. 6 in. between supports.	Breaking weight in lbs. of bars, 2 ft. 3 in. reduced to 4 ft. 6 in.	Mean breaking weight in lbs. (S.)	Ultimate deflection of 4 ft. 6 in. bars, in parts of an inch.	Power of the 4 ft. 6 in bars to resist impact.
Mean of 72 on No. 1	7.093	13970644	444	445	444.5	1.843	821
Do. of 65 on No. 2	7.120	14544293	494	499	496	1.632	811
Do. of 61 on No. 3	7.130	16622197	531	537	533	1.640	916
Do. of 41 on equal mixtures of Nos. 1, 2, and 3.	7.110	15200982	465	479	471	1.553	749.7
Do. of the same frm. the crucible, No. 16	7.190	14894800	551	597	574	1.625	901.2
Do. of 24 of equal mixtures as the 41, but plan'd	7.110	14676771	533	539	536	2.447	1313.1
Forty-seven Specimens from Messrs. Fairbairn and Hodgkinson's Tables of Nos. 1, 2, and 3, as under:—							
No. 1. 10	7.032	14132994	433	428	430	1.597	694
No. 2. 25	7.029	14570118	435	443	439	1.626	711
No. 3. 12	7.122	17683712	478	487	483	1.374	685
Summary of the Mean of the One Hundred and Ninety-eight Results of the three Qualities of Anthracite, and the Forty-seven from Messrs. Fairbairn and Hodgkinson's List.							
198	7.114	15045711	489	493	491	1.705	849
47	7.060	15462274	448	452	450	1.532	696

In making a comparison of the same numbers of the Anthracite iron, and those which are comprised in the latter 47 results, the three first of the six only, contained in the preceding table, must be taken, the other specimens being on iron, under other

conditions, containing the mixed, planed, and crucible results, &c., the final mean of which is given in the last table—which taken singly, or collectively, show a superior value in every column in favour of Anthracite iron as compared with the most numerous list of other makes;* the most prominent of which are *strength*, *deflection*, and *impact*. And it would appear that the No. 1 is the most uniform in texture, &c., having the greatest fluidity and softness and lowest specific gravity, and for its strength, which is the weakest, it is most to be relied upon, as far as it extends.

The No. 2, less uniform a little in texture and strength, fluidity, &c., but of higher specific gravity, and stronger than No. 1.

The No. 3 still less to be depended upon in the above qualities, but of increased specific gravity and strength to the No. 2.

The equal mixtures show a deterioration of the several Nos., compared to their values separately, and the same as regards specific gravity. The same, but cast from a crucible, exhibit an improved list of values, including a greater specific gravity.

The planed bars show an increased strength above the same metal in the black bar: this is the only specimen whose strength is increased, without the specific gravity being greater also, which must be due to the planing, and not any alteration of metal, &c.

It may be inferred from the whole of the tables, except the last, that the higher specific gravity exhibited by the iron, the greater the strength.

GLEANINGS FROM THE PROCEEDINGS OF THE GLASGOW MEETING OF THE BRITISH ASSOCIATION.

(Chiefly from the *Athenæum* Reports.)
(Continued from 363.)

Animal matters in Mineral Waters contain in great abundance a species of conferva, which in its structure resembles a species of *Oscillatoria*; it collects in large quantities around the sides of the wells, and, with deposits of inorganic and animal matters, forms layers of a dark green, white, and rose colour. In decomposing, these plants give out a more powerful odour than the water itself, a circumstance which has given rise to the opinion that a sulphuret of azote exists in these waters. These plants are peculiar to sulphureous waters, and probably have their existence determined by the sulphuretted hydrogen they contain. Throughout a large district in the neighbourhood of Askern, springs of water arise impregnated with sulphuretted hydrogen, and the soil around becomes saturated with it. In places where water runs over or collects on the soil, deposits are frequently seen varying from a light pink to a beautiful rose and carmine colour. These deposits rapidly appear and disappear, and have been found by the author to depend on the presence of two species of animalcules. One is oblong, with from two to ten stomachs, about the $\frac{1}{10000}$th of an inch long, and with rapid movements; the other is much longer, having about the same number of stomachs, and in its motions and shape very much resemble a *Vibrio*. The first resembles the *Astasia hæmatodes* of Ehrenberg, but it does not possess a tail, which is a characteristic of the genus *Astasia*. This animalcule was found, by Ehrenberg, forming a blood-coloured sediment in a lake on the Steppe of Platow in Siberia. These animalcules live in water artificially impregnated with sulphuretted hydrogen: they have never been seen in any place where sulphuretted hydrogen did not exist, and in many instances the author has been able to detect this gas by their presence, in places where he did not suspect its existence.—(*Dr. Lankester.*)

The Head and Heart.—Any reference to the affections and emotions brought a leer of incredulity on the countenance of the utilitarians, who suppose that when man begins to feel he ceases to reason. Give them, however, their darling arithmetic; let them have the osteology of their figurate skeleton; they are a species of naturalists, whose love is entirely confined to dry specimens, and who had no regard for the living animal moving in life and beauty. They are like those members who used to quit the house of parliament when Burke was speaking, as if they believed that where there was brilliancy of expression there could be no substratum of argument. They dissevered the association which the ancient Greeks had established between the two great ideas of their philosophy, uniting in one word, το καλον, the notions of truth and beauty, showing that they recognized nothing to be true which was not beautiful, and nothing to be beautiful which was not true. He trusted that the disseverance of these notions would not be perpetuated, but that we should all unite with common affection to erect a common shrine for the common worship of moral loveliness and moral truth.—*Dr. Chalmers.*)

Preservation of Iron from Oxidation.—The extensive and rapidly-increasing applications of iron to public and private structures of all kinds in which durability of material is a first requisite, have made it highly desirable to possess accurate information respecting the nature of the chemical forces which effect the destruction of this hard and apparently intractable metal. The preservation of iron from oxidation and corrosion,

* Except that of modulus of elasticity.

is indeed an object of paramount importance in civil engineering. The Association was therefore anxious to direct inquiry to this subject, and gladly availed himself of the assistance of Mr. Mallet (of Dublin), a gentleman peculiarly qualified for such investigations, both from his knowledge as a chemist, and from his opportunities of observation as a practical engineer. An extensive series of experiments has accordingly been instituted by him, with the support of the Association, on the action of sea and river water, in different circumstances as to purity and temperature, upon a large number of specimens of both cast and wrought iron of different kinds. These experiments are still in progress, and the effects are observed from time to time. They will afford valuable data for the engineer, and from the principal object of the inquiry, but a period of a few years will be required for its completion.

(*To be continued.*)

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

SIR WILLIAM BURNETT, KNIGHT OF SOMERSET HOUSE, MIDDLESEX, *for improvements in preserving animal, woollen, and other fibrous substances from decay.*—Enrolment Office, September 19, 1840.

This invention consists in the application of the chloride of zinc to the purposes specified. A wooden or other cistern is to be two parts filled with a solution of chloride of zinc in cold water, made by adding 1 lb. of the salt to every 5 gallons of water; after the solution has stood from 10 to 12 hours it is ready for use. The articles to be preserved, are to be pickled in this solution from 48 to 56 hours, according to their size, substance, &c.; they are then to be taken out and dried under cover, which completes the process.

CHARLES KEENE, OF SUSSEX-PLACE, REGENT'S PARK, MIDDLESEX, GNTLEMAN, *for improvements in producing surfaces on leather and fabrics.*—Enrolment Office, September 23, 1840.

This improvement consists in the application of a flexible water-proof surface to leather, &c., by means of Indian-rubber. The process is described as follows; take 100 lbs. of Indian-rubber cut into small pieces, and saturate it with 200 lbs. of turpentine, or other known solvent, for about 24 hours; then pass it several times between a pair of rollers set nearly close, sifting lamp black or other colouring matter on to it till the required hue is obtained; when the whole mass is of the consistency of stout dough or putty, it is to be put into a reservoir of water ready for use. The leathers to be operated upon should be uniform in size and thickness; a pair of rollers having been adjusted to suit the thickness of the skins and the quantity of pulp to be laid thereon, the upper roller is supplied with a damper of water to keep it continually wet, and thereby prevent the adherence of the India-rubber to the roller. A skin is placed with its edge between the rollers, and the operator having wetted his hands, takes a sufficient quantity of the India-rubber to cover the skin, laying it across the skin in contact with the wet roller; the rollers being then turned, the skin passes through them, receiving a smooth coat of the flexible and waterproof material upon its surface, which becomes thoroughly pressed into the fibres and pores of the leather. When dry it may be embossed or gilt in the usual manner. In order to remove the adhesiveness of the caoutchouc, shell-lac is to be dissolved in spirits of wine, with a small quantity of Venice turpentine, or other material, and two or three coats given to the leather. When dry, the leather thus prepared may be passed between embossing or plain rollers, or may be pressed between engraved or smooth metal plates.

The claim is, first, the mode of preparing external surfaces of leather, and fabrics made therefrom, with India-rubber (more or less dissolved) as a finished dressing as described. Second, the mode of employing water on the surfaces of rollers, when spreading India-rubber on to the surface of leather, as above described.

GEORGE RICHARDS ELKINGTON AND HENRY ELKINGTON, OF BIRMINGHAM, *for improvements in coating, covering, and plating certain metals.* Enrolment Office, September 25th, 1840.

Four separate processes are claimed as constituting these improvements, which are set forth at great length in the specification; they are briefly as follows:—

1. A mode of coating copper and its alloys with silver, by fusing silver on the surface of the metal, whereby the silver becomes alloyed or united with the surface of the metal so coated.

The metal is first to be silvered in the usual manner, and then treated with a hot concentrated solution of nitrate of silver; it is then heated nearly to redness to get rid of the acid. A quantity of calcined borax is heated to the melting point of silver in an iron pot; the coated metal is moved about in the borax, and lifted out occasionally; when the borax runs off the metal, the process is complete. Any borax that may remain is removed by boiling the article in dilute sulphuric acid (one part acid to twelve parts water), and then the article is to be annealed, and its surface improved by boiling in dilute sulphuric or muriate acid.

2. Three methods of coating metals with

silver: first, by oxide of silver dissolved in prussiate of potass, soda, or other analogous salt, or in pure ammonia; secondly, by means of the foregoing in connection with galvanism; thirdly, by means of a solution of silver in an acid, forming a neutral salt, in connection with galvanism.

The metal being first silvered, is to be immersed in the following hot solution: to 3 lbs. of prussiate of potass in water, add 5 oz. of oxide of silver, and boil them together; but if a thicker coat is required than can be obtained by this process, the solution of silver should be allowed to cool, and the article therein immersed should be exposed to the action of a galvanic current, as in the electrotype process. Another mode is to employ a solution of silver reduced by an acid to neutral salt, acted on as before by galvanism.

3. Two methods of coating or plating metals with gold; first, by gold in the metallic state, or oxide of gold, dissolved in prussiate of potass, or other soluble prussiate, or analogous salt; secondly, by using the foregoing in combination with galvanism.

To 2 lbs. prussiate of potass dissolved in a gallon of water, add 2 oz. oxide of gold or metallic gold in a finely divided state, and boil half an hour. For a thin coating the article is to be simply immersed; for a thinner coating it is to be exposed to a galvanic current, in the solution, as before directed with silver.

4. A mode of coating iron with other metals, by first cleaning it in a peculiar manner as a preparatory process.

The iron is first to be freed from all grease, and kept in an electro-negative state during the action of the cleaning acid, which is composed of one part sulphuric acid to sixteen parts of water, into which the iron is immersed, until a black scale of oxide is detached from the surface, which will leave it perfectly bright; the iron is then to be immersed in the following solution while boiling in a brass vessel: 1 lb. sulphate of copper, 3 lbs. water, and 2 oz. dilute sulphuric acid. When taken out it will be thinly, but firmly and evenly coated with copper, and may then be further coated either with silver or copper by the process previously described.

THOMAS SMEDLEY, OF HOLYWELL, FLINT, NORTH WALES, GENTLEMAN, *for improvements in the manufacture of pipes, tubes, and cylinders.*—Enrolment Office, Sept. 30, 1840.

This patentee claims, first, the mode of combining three, four, or more bowls, or rollers, for making, pressing, and elongating tubes, pipes and cylinders, without seam or joint, and without the use of a draw-bench. Unfortunately for him, his improvements are identical with those of Mr. Prosser, as described at length in our present number, and Mr. Prosser's being the prior patent, is, of course, the only valid one. The second claim, is for a new mode of constructing the mandril, on which tubes, &c. are made. In this case, the mandril is composed of three horizontal pieces, in such a manner, that on removing the centre, the remaining pieces are easily withdrawn.

THOMAS YOUNG, QUEEN-STREET, LONDON, MERCHANT, *for improvement in lamps.*—Enrolment Office, October 13, 1840.

These improvements are set forth in the following claims, viz.: 1. A mode of regulating the supply of oil to the burners of fountain lamps by means of floats, and cocks, or valves. 2. A mode of using bags or flexible vessels to contain the oil in fountain lamps, together with means of causing the oil to be expressed from such bags or flexible vessels. 3. A mode of applying a perforated plate at a position above the point of combustion of the wick of lamps, and thereby obtaining a more favourable application of air to the flame of the lamp. 4. A mode of improving the combustion and consequent flame of lamps, by applying a coil of wire round the flame.

In explanation of these claims, two different forms of lamps are described; they are both table lamps, of the pillar kind, with the usual argand burner. In the first the pedestal or base of the lamp contains a leather bag, enclosed in another of linen, of a pyramidal form, which forms the reservoir for the oil. A series of metal rings are placed one above the other, gradually decreasing in size, around the oil-bag, which serve the double office of keeping the bag in shape, and by their weight pressing upon the bag cause the oil to be forced up to supply the burner; this is also assisted by the sinking of the pillar of the lamp down into the pedestal. The oil-bag is affixed to a bent tube at the top of the pedestal, furnished with a cock and lever, from which a rod passes up the oil channel to the top of the lamp, and is there furnished with a small ball or float. The weight of the pillar of the lamp, and of the metal rings around the bag constantly pressing upon the oil, has a tendency to force it up to the top of the lamp, where its escape is uniformly regulated by the float acting on the cock before mentioned. In the other lamp the pillar does not slide in, but is attached to the pedestal, within which there are two flexible oil-bags; a series of swinging bars hanging from the upper part of the pedestal surround these bags and press upon their sides, the pressure being aided by spiral springs placed around the inside of the pedestal. In each case a column of oil is supported on a level with the burner; in the latter case, the cock and valve are both placed at the top of the pillar.

Two methods of supporting the perforated plate, above the point of combustion, are shown; the first is by resting it on a shoulder formed in a peculiar shaped glass chimney; the second is by means of thin metal standards. Finally, the mode of applying a coiled wire around the flame is shown; *the advantages* of which, as well as of the perforated plates, we must confess are much beyond our comprehension.

PRACTICAL HINTS ON ROOFING.

Nature covers the bodies and limbs of birds and beasts with feathers and hair, laid in small portions one under another, beneath which the creatures may freely move, carrying their roofs with them; and, she even provides many species of them with oil, to throw off wet the more effectually. Man, who is, in himself, so little provided against the inclemencies of weather, soon discovered nature's mode of roofing, and adopted it. Thatch, shingles, weather boarding, tiles, slates, lead, copper, have all along been used in this mode, with various degrees of excellence. Under all these, the building may settle greatly, and yet no water penetrate the covering.

The pretence of improved science, or of economy, now leads the unwary to adopt various kinds of cementitious coverings; these of a nature so rigid as to flaw with every jar and settlement of the fabric, and, with every accident, intercept the rain-water in its flow. The rays of the sun, the contractions of frost, keep all these fragile unaccommodating substances constantly in a broken state; that water, which by other coverings is thrown off, is with much avidity drunken by these; hence, all within the fabric is ruined. Houses thus roofed are as much exposed to the weather as birds and beasts would be, if their feathers and hair were plucked from their bodies, and were laid again upon them without order. In such roofs the laws of nature are violated; they cannot, therefore, be either scientific or economical. Frequent renewal cannot lead to economy; constant fracture cannot be security; the penetration of wet, and the destruction of the supports of a roof, cannot be freedom from danger. Even the construction of a roof flat, to be covered with lead, requires more skill and caution than are usually possessed by the makers of cement roofs; what success, then, can attend their inferior skill, guided by improper feelings, and worked with unmanageable commodities?

The makers of inflammable roofs should everywhere be prosecuted as public incendiaries. By the 47th section of the Building Act, roofs are directed to be covered with glass, copper, lead, tin, slate, tile, or artificial stône; if, then, in the metropolis, that description of civil liberty which requires that each man's property should be protected from consumption by his neighbours—if every inmate of a building should be preserved from jeopardy—what plea can be set up for covering roofs with bituminous tesseras, or with Jew's pitch?—*Specifications for Practical Architecture, by A. Bartholomew.*

THE "GREAT WESTERN" STEAM-SHIP.

Sir,—Your Magazine of Saturday, Sept. 5, contains a letter from "P. R. H.," dated "New York." The letter in question is written in so narrow and uncandid a spirit, that I cannot refrain, though in no manner connected with the *Great Western*, or her engines, from making some observations upon it. "P. R. H." appears to be labouring under some strange confusion of ideas, when he recommends "Observator" to make a journey to Bristol, to examine the engines of the Great Western in order to render an act of justice to Mr. Hall. Now what the alleged dilapidated condition of the columns, and other parts of the frames of the engines of the *Great Western* can have to do with Mr. Hall's condensers would puzzle any one to discover. It is most extraordinary that, "P. R. H." should take "Observator" to task for not making "himself acquainted with all the facts connected with the question," when "P. R. H." himself passes over the only question, which can connect Mr. Hall's name with the arrangement of the machinery of the *Great Western*, viz.: the condensers. In adverting to this part of the subject, "P. R. H." is either ignorant or uncandid, and in assuming the tone he has done in his letter, he is not the less culpable whether his suppression of the truth arises from one or the other of these causes. The engines of the *Great Western* have common condensers, and the vacuum is effected by the operation of ordinary injection; yet from the judicious arrangements made for changing the water of the boilers, they, the boilers remain in nearly as perfect condition, as when they first were put to work. In what way then can "Observator" owe Mr. Hall one more letter, in which letter, after having made a journey to Bristol to examine the engines, he is fully to acknowledge his error to Mr. Hall? In conclusion, allow me to say, that it is not to such cavillers as "P. R. H.," that the world would ever have been indebted for so noble a work of human skill as the machinery of the *Great Western;* and that in endeavouring to depreciate its excellence, he has shown how little he is capable of appreciating the difficulties attending such a construction. He appears to have wholly lost sight of the im-

portant part the *Great Western* has sustained in being the first successful Transatlantic steamer that was able to sustain a continued intercourse between Great Britain and America.

I am, Sir, your obedient servant,

VERITAS.

London, Sept. 24, 1840.

MORE IRON STEAMERS.

Sir,—Having latterly seen so much stated in your Magazine, and elsewhere, of the progress which is being made in iron boat-building, it will not be out of place, perhaps, if I inform you that I had last week the pleasure of a trip down the river in one which has just been completed by Messrs. Fairbairn and Co., of the Isle of Dogs. I do not profess to know much of the relative speed of the boats on the Thames, but the *Rose* appeared to me to be uncommonly fast. She started from Greenwich with a number of Margate and Ramsgate boats, amongst which were the *City of London*, the *Duchess of Kent*, &c., all of which she passed with the greatest ease, although she was heavily burdened with masts and rigging for a sea voyage. From the remarks which were made on board by the builders and others, I gathered that this boat is 310 tons burden, and is intended to carry passengers and goods between Sydney and the Hunters' River, in New South Wales, to which place it is going in the course of a few days, carrying upwards of 120 tons of coal *to steam with*, in case of calms or foul weather. If all iron steam boats are built as strong as this one appears to me to be, it will soon cease to create wonder if we find iron floating to all parts of the globe.

I understand that the Messrs. Fairbairn have in progress another steam boat, of exactly the same dimensions, for the same destination, to be called the *Thistle*, besides numerous others for various parts of the world, so that we may soon expect to see our flag floating above *iron* in every known sea. Let foes say what they will, it is evident, from *the lead* taken by our countrymen in every department of mechanical science, that the sinews of Old England yet remain unshaken, and as a true Briton I hope they ever will.

I am, Sir,
Your obedient servant,

AN OLD READER.

London, October 14th, 1840.

NOTES AND NOTICES.

Diving Operations—Mr. Deane.—We have seen with great pleasure a prospectus of a work by Mr. John Deane, of Portsmouth, on "Submarine Recoveries, Relics, and Antiquities." It is a matter of notoriety among all who take an interest in such matters, that Mr. John Deane and his brothers were the first persons who brought the diving helmet to that degree of perfection, which has, in recent times, made the recovery of sunken treasures an office of such (comparatively) easy accomplishment. Neither is there any individual who has been more actively instrumental than Mr. J. Deane in those "recoveries" of which he now, with great fitness, purposes to be the historian. The work is to be embellished with coloured lithographic plates, some specimens of which accompanying the prospectus are very beautiful, and to all appearance drawn and coloured with great fidelity to nature. Intending subscribers may be obliged to us for adding, that Mr. Deane's address is North-street, Gosport, Hants.

The Propeller.—A vessel bearing this title is at present running between Blackwall and Greenwich. She is a small vessel of elegant proportions, built by Mr. Ditchburn, of Blackwall. She has two very pretty "steeple engines," made by Mr. Beale, of Greenwich, of 24 horse power, which work two broad iron "propellers," placed one on each side the boat. Their action is precisely similar to those patented by Mr. John Lee Stevens, of Plymouth, in 1828, and described at page 418, of our 9th volume. The only difference is, that Mr. Stevens employed three paddles, worked by a three throw crank, while, in the present instance, a single crank and one paddle is only used. The motion of the propellers on alternate sides of the vessel communicates a disagreeable rocking motion, while their intermittent blows on the water cause a vibration which is apparent throughout the whole of the machinery. As we know that this kind of propeller is an especial favourite with many of our readers, we would strongly recommend them to avail themselves of this opportunity of observing its action, and judging for themselves. The speed of the "propeller" is about 10 miles an hour, her steam pressure is 5 lbs. on the inch, and she makes 40 strokes per minute. The propellers cause a slight eddy in the water, but they leave no swell behind, which is an advantage (and we fancy the only one) over paddle-wheels. The great breadth required for the action of the propellers, is a very considerable drawback.

Portraits on Roman Coins.—In the earliest and more simple days of Rome the portraits of no living personage appeared on the public money; the heads were those of their deities, or some personage who had received divine honours. Julius Cæsar was the first who obtained the express permission of the Senate to place his portrait on the coins, and the example was soon followed by others. The heads of Lepidus and of Antony appear on their denarii, and even the money of Brutus, with the two daggers and cap of liberty, bears on the obverse the head of the man who killed his friend because he had assumed the regal power and authority. We have no evidence, however, that this money, which is of great rarity, was struck with the knowledge and sanction of Brutus; and it is possible that it is a posthumous coin.—*Akerman's Numismatic Manual.*

Spontaneous Combustion.—The result of the investigation that has been going on at Devonport, to ascertain the cause of the late fire, has ended in a discovery that it originated in the spontaneous combustion of a large mass of rubbish in a bin situated under the shed which covered the *Talavera*; thus doing away with the supposed charge of incendiarism altogether; and showing the necessity of placing the refuse of all combustible matters likely to accumulate, in places where combustion, should it occur, would not communicate with any description of buildings.

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MR. SAMUEL SEAWARD'S PATENT METHODS OF WORKING THE CRANKS OF STEAM ENGINES.

Fig. 1.

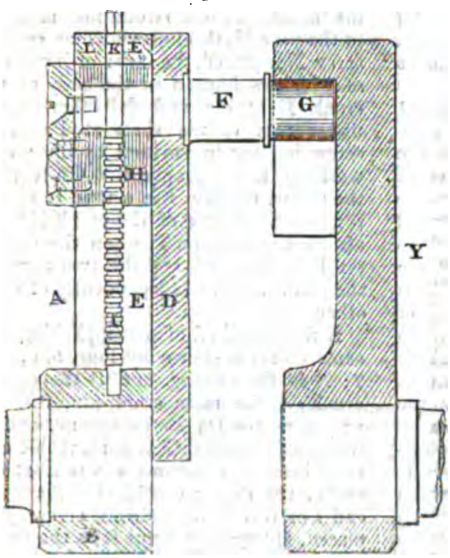


Fig 2.

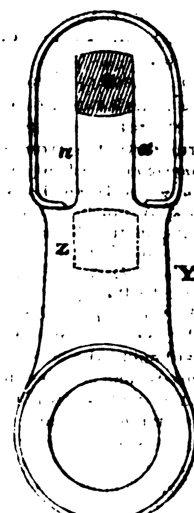


Fig. 3.

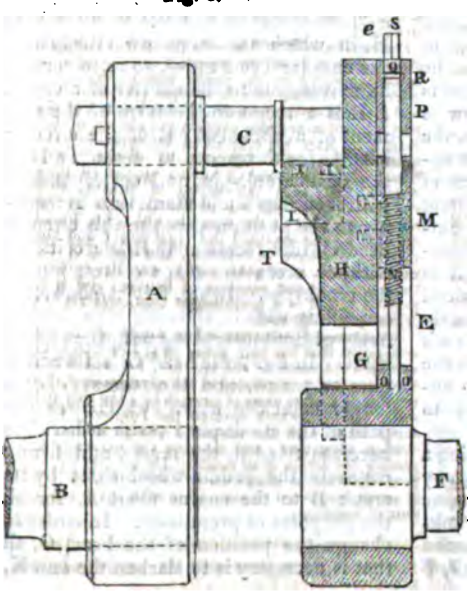
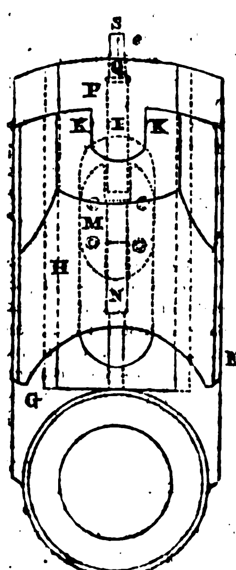


Fig. 4.



MR. SAMUEL SEAWARD'S PATENT METHODS OF WORKING THE CRANKS OF STEAM ENGINES.

We have already laid before our readers some of the improvements in the construction and application of steam engines, recently patented by Mr. Samuel Seaward; we now gladly resume the subject, and proceed to describe some very ingenious methods of working the cranks, which form the fourth, fifth, and sixth heads of Mr. Seaward's patent.

The first of these, as shown in figs. 1 and 2, is a mode of constructing cranks in such a manner as to admit of the stroke of the piston being lengthened or shortened at pleasure, and also to enable the paddles to be promptly detached from the engine. Fig. 1. A is the driving, and Y the driven crank; B is the main boss of the driving crank, by which it is firmly keyed to the main shaft of the engine; D is a strong slide fitted to the shank E of the driving shaft, which carries a projecting pin F, the toe of which (G) passes into a recess in the crank Y, and forms the connection by which the driving crank carries the driven one round with it. On the slide D a strong nut H is fixed, through which a strong endless screw I passes, which works at one end into the body of the crank at P, and at the other end into the shank E. J is a projecting square head, by which this screw can be turned round at pleasure; the screw is kept in its place by a pin L passing through the grove K. By this arrangement of parts it will be evident, that as the screw is turned to the right or the left hand, the slide D, with the crank-pin F, must approach to or recede from the centre of the main shaft C, thereby lengthening or shortening the crank, and consequently the stroke of the piston. To disconnect the paddle from the engine it is only necessary to turn the screw I until the crank-pin F and its toe G are entirely withdrawn from between the cheeks *a a* (fig. 2) into the open space Z, when the two cranks—and consequently the engines and paddles—are at liberty to move independent of each other.

Another mode of instantly detaching a driving from a driven crank is shown by figures 3 and 4—where A is the engine crank, B the main shaft, C the crank-pin, with its projecting toe D flattened on its sides; E is the paddle crank, F its shaft; H is a strong slide affixed to the shank G, having an open jaw I, with two parallel sides K K (fig. 4). The depth of this jaw clear of the shank G—that is, from L L, fig. 1—is such as to correspond exactly with the length of the toe D. M is a strong nut, attached to the slide H, through which an endless screw N is placed, the inner or lower end of which is housed in the body of the crank E at *o o*, and the other in the upper part of the shaft at P. This screw is kept in position by the pin R working in the groove Q. On turning the screw, the jaw I is caused to recede towards the centre of the crank E till it attains the position T, when the crank-pin D is liberated, and the two arms of the crank revolve independently of each other.

A third method of accomplishing the same object is shown by Figs. 5, 6, and 7: A is the driving, and B the driven crank; C the main crank-pin, with its projecting toe D; E the engine, and F the paddle shafts; G is a moveable circular head, inserted in the boss H at the end of the driven crank. On the inner end I of this head a strong screw *f f* is placed, taking into a nut K at the back, by which the head can be firmly secured to the driven crank B. Figs. 6 and 7, *c d* are quarter circle grooves in the boss H, in which the stops *a b* attached to the circular head move, so as to confine its movements to the quarter of a circle. L L is a recess in the form of the segment of a circle cut out of the circular head G for the reception of the toe D of the main crank-pin, and corresponding with it in depth and diameter. According to the position given to this circular head G, this recess may either coincide with, or cross the plane of rotation of the crank-pin. In fig. 6 it is shown as coinciding with it, allowing it to revolve freely without interfering with the paddle shaft. In fig. 7 the head G is turned a quarter round, and the recess L L no longer coincides with, but crosses the path of the crank-pin D, which therefore becomes fixed in the recess, and firmly connects the paddle-wheel shaft by its crank B to the engine shaft A, for all the purposes of propulsion. In order to change the position of the head G, all that is necessary is to slacken the nut K,

Fig. 5.

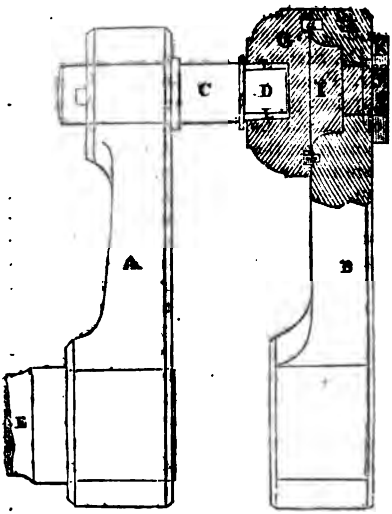


Fig. 6.

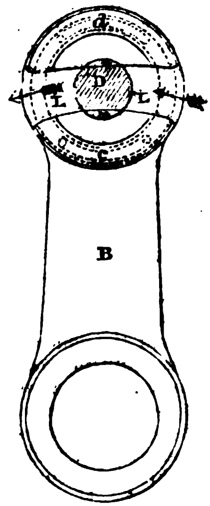
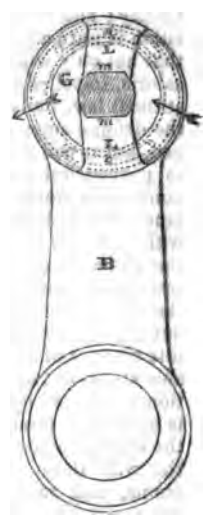


Fig. 7.



turn round G one-fourth of a circle, and then tighten the nut again. The toe pin D is flattened a little at the sides *m m*, in order to give greater clearance for the groove in the circular head.

From the great advantages afforded by these simple modifications in the construction of engine cranks, and the very liberal terms upon which Mr. Seaward proposes to license their use, we suspect that their employment will at once become universal.

ON THE THEORY OF THE INHERENT ACTIVITY OF MATTER—MR. WIGNEY IN REPLY TO MR. PRATER.

Sir,—The absence of Mr. Prater from home for three or four months, has induced me to refrain from replying to his letter, inserted in No. 880, page 35, of your work, until his expected return.

The opinion expressed by the philosophical friend of Mr. Prater, that "all matter seems to have elasticity when compressed, and on the pressure being taken off, it of course moves," I cannot coincide with, nor can I believe in the doctrine of innate repulsion, as possessed by bodies, or the atoms of which they are composed. That many bodies are elastic, is both evident and indisputable; and that when the pressure to which they have been subject, and which has caused their compression is removed, they will resume their original bulk or volume is plain; but I think it is not the result of "inherent activity," as possessed either by the body or the atoms of which it is composed.

As an illustration, I will refer to the condensation, or the compression of a large bulk of air in the chamber of an air-gun. In this operation, the air which is forced into the chamber by the piston, and retained therein by the valve, the elasticity of the air forcing the valve to its seat, is composed of ponderable atoms which cannot permeate the metal of which the chamber is formed, and of the imponderable atoms of caloric which are able to permeate; and the result of this operation is, that the whole of the ponderable atoms which are forced into the chamber are retained there, occupying a much smaller space as to position, than heretofore; and the greatest portion of the imponderable atoms of caloric which are forced in, are also forced out, by exudation through the metal composing the chamber. It appears to me, that the Creator of all things has ordained, that when a definite amount of the two classes of ponderable atoms—oxygen and nitrogen, are mixed together, that then a definite amount of the imponderable atoms of caloric shall unite with them, by

(what I would term) the law of constituency; and being blended, the composition is pure air. It also appears to me, that not only will a definite amount of caloric, impelled by the force of this constituent law, unite and be blended with the definite amount of oxygen and nitrogen, but it will mix with them agreeably to geometrical rule, and separate the ponderable atoms to a proportionate distance from each other. Conformably then with this view of the subject, we have in the chamber of the air-gun, after the process of condensation is completed, the definite proportion of the atoms of oxygen and nitrogen, but not the definite amount of caloric, and the ponderable atoms out of their constituent position as effected by pressure. And what is needed, to produce the combination of the original amount of constituent caloric, with those constituent ponderable atoms, and to cause them to resume their constituent position? Nothing but amplitude of space; and if the valve is opened, the constituent caloric will rush in, expand the ponderable atoms to their original position, and the celerity of the combination and the expansion, will furnish the mechanical force resulting. And if this view of the subject is correct, the elasticity of air is not due to the inherent activity of its atoms, but to the constituent power of combination with which caloric is invested, to unite with ponderable atoms to a definite amount, when they are blended in definite proportions, by the law of affinity and the power of attraction.

Mr. Prater states, that the great object of his former paper, was to apply *the fact of repulsion*, as being the cause of the diffusion of the gases, and observes, that "if any one replies, this is obvious; I shall maintain that obvious as it is, the idea does not seem to have occurred, either to Drs. Dalton, Mitchell, Stevens, Professor Graham, or any one else, as far as I am aware." But I do not think that he will find any one readily prepared to come forward and say that such is a fact, much less that it is obvious, and therefore I think that he will be spared the effort of maintaining that such is the fact, or that such distinguished individuals did not conceive such an erroneous idea; but I think he will have much difficulty in proving to your readers that he did not intend to convey the idea to them, that repulsion is attributable to the inherent activity of atoms, and motion to repulsion.

Dr. Stevens's work on the blood, and Mr. Prater's "Experimental Chemical Physiology," I have not seen, and therefore cannot be in a situation to offer an opinion on their contents; but the cause assigned by Dr. Stevens, "latent attraction," to effect the passage of the oxygen of the air through a bladder to the carbonic acid confined in a vessel, and ultimately to effect a displacement, appears to me to be quite correct; and although I have no present time to spare for experimental pursuits, yet the observations which I have almost daily the opportunity of making, on the operation and results of vinous fermentation, and which furnish analogous evidence in support of such an opinion, leads me to the conclusion that his supposition is perfectly correct.

It is long since that I read in some work (the name of the author of which I forget,) that if wort, with which is blended a proper amount of yeast to insure a vinous fermentation, if exposed to the atmospere, is placed beneath the receiver of an air-pump, and the air is exhausted, that such wort will not be subject to vinous fermentation for the want of a sufficient supply of oxygen to support the process; and if this statement is correct, it implies, that without the impartation of oxygen to the wort subsequent to its composition, (by diffusion) that such a process cannot be conducted and that glass is impervious to oxygen. Taking it for granted, therefore, that the impartation of oxygen is absolutely necessary to effect the process of vinous fermentation, previous to its commencement and during its progress, I have reason to know that wood is pervious to oxygen, as many years since I conducted the process experimentally in an air-tight cask, in the head of which was an orifice, in which was inserted and luted, the head of an alembic, and the spirit conveyance pipe inserted and luted in a receiver, so that no air could gain access to the wort within the cask, and yet the process of fermentation was well and extensively conducted from the commencement to the end. If, therefore, the presence of a continued supply of oxygen were necessary to support the progress of fermentation, and atmos-

pheric air were not admitted, then must the necessary supply of oxygen, I presume, have been transmitted from the atmosphere through the pores of the wood.

I will avail myself of this suitable opportunity for the probable benefit of some of your readers who may be brewers, to inform them, that my motive for trying this experiment was to ascertain if wort in a state of fermentation in open fermenting tuns, sustained a loss of spirit during the process, as was alleged to be the case; and if by conducting it in hermetically closed tuns, such loss might be avoided, as it was affirmed it might be; and the result of the operation was that no spirit was brought over into the receiver, and nothing but water and carbonic acid gas.

It may be desirable to notice here, that the presence of a definite amount of thermometric heat in the wort is absolutely necessary to enable the oxygen of the atmospere to combine with the carbon of the wort; and that the greater the amount of heat present, within certain limits, the more rapid and extensive will be the transfer of the oxygen. And again, the higher the thermometric temperature of the atmosphere, the greater is the facility with which the oxygen will be imparted to the wort; and thus we find that attraction between the atoms of oxygen and carbon, aided by the expansive power of heat, is the most probable cause of the gaseous diffusion, instead of an inherent repulsive power possessed by the particles of matter as Mr. Prater imagines.

Another illustrative proof is furnished by vinous fermentation, that heat is not only the primary and co-operative cause of the formation of gases, but also of their diffusion; I allude to the creation of carbonic acid gas in wort subject to such process, its subsequent expulsion therefrom, and its final diffusion throughout the atmosphere. In the formation of such gas, we trace the elementary and necessary conditions to effect its subsequent diffusion; for, as carbonic acid gas is heavier than atmospheric air, both being of the same thermometric temperature, so is it necessary in order that its diffusion throughout the superincumbent atmosphere may be effected, that the thermometric temperature of the gas, at the period of its evolution from the surface of the wort should much exceed the thermometric temperature of the atmosphere; and thus for the formation of this gas within the wort, its ascension to the surface and its ultimate diffusion throughout the atmosphere, we find an abundant supply of thermometric heat, resulting from the liberation of latent heat, set free by the decomposition of the wort, and the decomposition of that wort effected by the affinity subsisting, and the attraction exerted between the carbon of the wort and the oxygen of the atmosphere—their union being aided and facilitated by thermometric heat.

The superfluous observations of Mr. Prater relative to an indirect partiality for the "occult sciences," &c., may be intended as dust for the eyes of your readers, but I trust that there are some who will think that "the accuser is the transgressor," and whom he will find it very difficult to persuade that inherent activity, or inherent repulsion, is not an imaginary force, and that of his own conceiving.

Mr. Prater is quite mistaken in his supposition that I used the term *diffusion* as synonymous with the term *expansion*, for in making the statement, "and finally, the expansion (diffusion) or contraction of gases, is alone attributable to the impartation thereto, or the abstraction therefrom, of caloric" I placed the word *diffusion* in parenthesis, under the idea that Mr. Prater had erroneously used such term, instead of the term expansion; because by his mode of reasoning he appeared to me to be endeavouring to establish the opinion, that the expansion of gases was due to the inherent activity possessed by the atoms of which they are composed; and my object was to prove that it was attributable to the impartation of heat. If he had made use of the term admixture of different gases instead of the term diffusion, to convey his meaning, I should neither have endeavoured to show the cause of their expansion, or parenthetically written the term diffusion.

Immediately following his notice of the term diffusion, Mr. Prater states, "We all know a gas expands when heated, but when carbonic acid and oxygen, or air, are merely left in juxta position (*without being heated at all*) they still gradually

mix." And then follows his question, "How then does the impartation of caloric explain the mixture in this case?" Now from the explanation which I have just given as to my misapprehension of his meaning and intent in using the term diffusion, it will appear evident that I did not attempt to attribute the admixture of different gases of different specific gravity, to heat alone, and their admixture contrary to the law of gravity, when a gas of least specific gravity is superposited on a gas of greater specific gravity; and as it is to be presumed that Mr. Prater read that part of my letter, wherein I endeavoured to account for the amalgamation on the principle of affinity subsisting, and the power of attraction exerted between the constituent ponderable atoms of each gas, his question appears to me to be quite superfluous. And although I made no allusion to heat as being an accessary cause in producing the effect of admixture, yet I am decidedly of opinion that it does so operate, although Mr. Prater states that carbonic acid and oxygen, or air, will gradually mix without being heated at all; for in addition to the example which I have already furnished, with respect to the conversion of carbonic acid formed in wort in the state of fermentation into carbonic acid gas, and its final admixture with, and diffusion throughout the atmosphere, as induced by the liberation of latent heat, resulting from the decomposition of the wort, I may observe that I see no reason why carbonic acid may not be gradually blended with the atmosphere, and consequently displaced from the vessel, as well as that water of much greater specific gravity should also be mixed with it by the process of evaporation, the impartation of natural heat to the carbonic acid, or the reduction of the temperature of the atmosphere below that of the carbonic acid, being sufficient in either case to effect the admixture.

Mr. Prater complains of my advancing opinions hypothetically, and stating occurrences as most probable; but it appears to me to be much more consistent to furnish doubtful opinions on controversial subjects, and such as will not furnish positive and indubitable proof, than first to imagine an evidence, and then boldly to assert it as a proof of a fact; and before Mr. Prater undertakes to say what it appears to him to be incumbent on others to do, it would probably be better for him to examine more carefully and attentively the evidences which his experimental pursuits furnish, and to reflect more deeply before he deduces his positive conclusions as to the cause of the effects produced.

When I read the title of Mr. Prater's essay, "On inherent activity as a property of the particles of matter unrestrained by cohesion, atmospheric pressure, or other forces: Demonstration, that this property is adequate to the explanation of the diffusive power of the gases," and read all the remarks which he made, and examined the evidences which he adduced in support of his theory, it appeared to me that he really did not believe in the "*vis inertiæ* of matter;" for in the first place, he noticed the motion of matter in mass, when floating in water, and attributed it to the inherent activity of its atoms in aggregate combination in the form of powder, making a distinction as to the difference in the force of such power, as dependant on the bulk of the mass, or in other words, attributing to atoms the property of inherent activity, subject to gradual and final extinction, in proportion to the amount of their aggregate combination. Now, there appears to me to be a singular inconsistency in the supposition that atoms are invested with the power of inherent activity when not in combination, and that such power should become extinct on their becoming united, to some definite extent as to number, and after having lost such power, I should much like to learn from Mr. Prater from what source they are enabled to resume it, when they are again subject to ultimate division or separation?

It appears to me that Whatley is perfectly right in his conclusion, that the heterogeneity of particles is a cause of motion, but I do not conceive that either chemical affinity or attraction implies inherent activity, and in fact, I conceive that the term affinity is improperly used to denote that impulse which precedes attraction, and without the previous exercise of which the power of attraction cannot be called into action; for the meaning of the term affinity is, "kindred, likeness," and I should imagine was first adopted to express that desire

in atoms to unite, as may be supposed to exist between kindred beings, or persons of similar habits, manners, &c. But if we look to the meaning of the term heterogeneous, "unlike in Nature," and apply it to denote the division of atoms into classes, unlike in properties, tendencies, &c., and wish to express the tendency, desire or disposition which atoms of different classes have to unite with each other (such as oxygen and carbon, &c.), then we appear to need some conventional term, the meaning of which is in more accordance with that which it is intended to express, than the term affinity.

In concluding that the heterogeneity of atoms is a cause of motion, it is necessary in order to produce the effect, that atoms of different classes should be placed in proximity, and within the sphere of their separate or mutual power of attraction, and motion and union, proximate or close will ensue; but if you place atoms of the same class in proximity, no motion will ensue. In the first case the tendency, disposition or desire of the atoms to unite (termed affinity) and the power which they have to unite (by what is termed attraction), will prove superior to the *vis inertiæ*, (which otherwise would retain them in their position), and they will therefore move and unite. But in the second case, as no superior power operates upon them, they retain their position by the power termed *vis inertiæ*.

Mr. Prater appears to doubt that the evaporation of water at the ordinary temperature of the atmosphere, is attributable to heat imparted from the sun, because, as he observes, the evaporation occurs by night as well as by day, and I suppose he means thereby to infer, that as such impartation cannot occur at night from such a source, and as the evaporation still continues, so such cannot be the cause. But such an inference does not appear to me to be tenable, for the sun having imparted to the earth and its covering a large amount of heat in the course of the day, it needs but a reduction in the temperature of the atmosphere to render that heat returnable, agreeably to the law of equal diffusion to which heat is subject. Now this reduction generally occurs during the night, and therefore we find that a transition of heat from the earth and the substances which cover its surface takes place—that portion which emanates from water, carrying with it some of the ponderable atoms of which such water is constituted, and the compound which evolates or evaporates being termed vapour.

In relation to the evaporation of water *in vacuo*, before I offer any further observations on the subject, it appears to me to be necessary that I should point out a typographical error in the following sentence, in page 5 of my letter, "by the same law it rushes in among the atoms of which the air is composed," the word "air," should have been "water."

The evaporation of water *in vacuo*, which I attributed to the impartation of heat from the external atmosphere and surrounding media through the glass receiver upon the withdrawal of the air, Mr. Prater appears to question, because it is found that "so far from the temperature being increased in this case, there seems reason to believe that it is actually lower;" and he further adds, "so far from rising, a thermometer would probably fall when put into an exhausted receiver;" whence he appears to conclude that because an increase of thermometric temperature does not occur, such a transition of heat does not take place, and cannot therefore be the cause of the evaporation of the water. But Mr. Prater seems to lose sight altogether of the possibility or probability, and perhaps certainty, that the heat which thus enters becomes latent, because it enters agreeably to the dictates of the law of equal diffusion, which prescribes the entry to fill up the space which otherwise would be vacant upon the withdrawal of the air, and thus restore the equilibrium of distribution. And it should be remembered, that in exhausting the receiver of the air within, a large amount of latent heat forming a constituent of the air is also withdrawn, and which being constituent, and inseparable from the constituent ponderable atoms other than by pressure, or by abstraction in obedience to the law of equal diffusion, must therefore be withdrawn simultaneously. This abstraction then of the constituent latent heat of the air from within the receiver must necessarily cause the thermometric heat of the water to pass into the space above

to replace the latent heat abstracted; and by its transition a portion of the ponderable atoms of the water will be elevated with it, and together constitute the vapour which is seen to rise; and consequently the thermometric temperature of the water will be diminished, and indicated by a corresponding effect on the mercury in the tube of the thermometer; but this reduction in the thermometric temperature of the interior of the receiver, and the solid or fluid substances within, would, I apprehend, be but temporary, because by such reduction for the purpose of furnishing a quota of the requisite latent heat to fill up the space previously occupied by air, the temperature of such water or other substance would be reduced below the temperature of the external media, and such being the case, a transition of heat from such external media to the water or other substance within, would soon restore it to an equal temperature.

My reply to Mr. Prater's question, "Why, then, did not Mr. Wigney keep to the point of gases especially?" is, because I saw no sufficient reason why I should, and because I considered it more consistent to notice every example which he adduced in support of his theory, in the consecutive order in which he furnished them, and if my observations upon the subject of fluids were more extensive than upon the subject of gases, it was simply because his illustrations were more ample in that department.

As relates to Mr. Prater's observations on the circulation of the blood, they all appeared to me to be made for the express purpose of endeavouring to prove his belief that its motion is the result of the power of inherent activity, with which he supposes its atoms are invested; and whether his statements were decisive or not, my endeavour was merely to prove that such motion is attributable to the impartation of heat as a primary cause.

If Mr. Prater is determined to stand fast in his conclusions until he is refuted by experiments, I think that he will remain in that position long enough, for I can perceive no probability that any can ever be conducted that will afford occular or other demonstration even of the motion of atoms, much less of the power which causes it; and as upon such subjects we can only reason, without furnishing indubitable evidence, and offer conjectural opinions, without yielding proof, so must we finish where we began, and leave that which is yet a mystery as incomprehensible as we found it; and fearing that your readers will be much more weary than edified by the discussion, and thanking you for the insertion, and them for their patience, if they have read my portions of it,

I remain, Sir, your obedient servant,

G. A. Wigney.

Brighton, September 18, 1840.

POINTS BEARING UPON THE "NEW THEORY OF THE UNIVERSE," (PAGE 555, VOL. XXXII.)

Sir,—Five out of six of the three volumed works of the present day, are like flutes drawn out until they are flat enough to suit a certain number of other flat instruments which surround them. But the volumes have this advantage, they make no noise. There is more food for thought and ingenuity in one of your numbers than in a thousand of them. This is all as it should be. Your work is intended for the useful part of the community, the others for the idle part. Thus the value of time is properly cared for. If you approve of the following observations, you will oblige me by their insertion in an early number. Independently of my theory respecting motion, I cannot help viewing with great distrust the present system of trains of carriages on rail-roads, with their unequal distribution of weight. The wear and tear occasioned by one predominating force dragging, at an equal pace, vehicles so dissimilarly circumstanced must be enormous; to say nothing of the danger produced when the already wrenched material is again brought into use under altered circumstances. The only railroad I ever travelled on is the Great Western. We were four on one side and one on the other. Must not the carriage in which we were have received more damage than if the weight had been more equally disposed? I cannot believe (all things considered,) that more than one vehicle, be its size what it may, ought to be attached to one engine, not only on account of the greater

wear and tear, but also on account of the increased danger from concussion, the difficulty of accelerating and of arresting or checking the progress of a train being almost insurmountable. We have no examples in nature of various attached weights dependant on one moving form. I offer these observations as suitable to the present theory of motion. They would be equally proper with respect to my own. But that on some future occasion.

I remain, Sir, your obedient servant,

E. A. M.

October 1, 1840.

(From the Same.)

Sir,—I should esteem it a favour if one of your able correspondents, would (without adopting my theory,) tell me the reason why a billiard ball runs away when it is hit? To save the trouble of a reference, that part of my theory which bears on this question affirms the existence of fluids which traverse through the atmosphere in *every direction*. Without these traversing fluids I can find no rational cause for the continuance of motion in inanimate matter. As I am no mathematician I am desirous of having an answer to my question in plain English. You, Sir, are too well informed not to be fully aware of the great importance of this question. On it, as on a pivot, the most interesting experiments at present in hand by the philosophers of the day, may be said to hang, as well as the explanation of many things which are at present inexplicable. It is many years since so interesting a subject has been offered for the discussion of the scientific world; its very importance, appearing as it does from an unknown quarter, casts a kind of mist around it; but it is a mist that it will be well worth while to disperse.

I remain, Sir,

Your obliged reader,

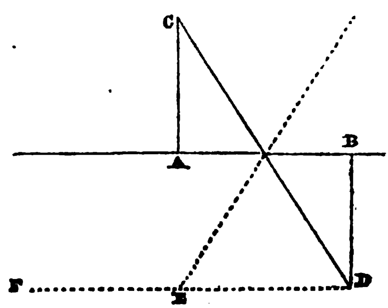
E. A. M.

October 10, 1840.

SCREW PROPELLERS SUPERIOR TO PADDLE-WHEELS.

Sir,—I have read in the *Mechanics' Magazine*, Nos. 892-3, some observations by Mr. Holebrook upon Smith's Patent Ship Propeller, and upon the Report published by Captain Edward Chappell, R. N., respecting the performances of the *Archimedes*, and the advantages attendant upon Mr. Smith's method of propelling steam-vessels. My attention has been directed to the subject by Mr. Holebrook's observations, and as I have arrived at conclusions diametrically opposite to those entertained by that gentleman, upon what seem to me very sufficient grounds, I feel persuaded that the impartial character of your publication will induce you to give insertion to the following statement, intended to do justice to a gallant officer, as well as to place the subject of propulsion by screws in a fair and proper light.

1. From the action of power in a screw being in a plane at right angles with its axis, or parallel with the base of a correspondent cylinder, the resistance arising from *inertia* must be overcome in a direction parallel with the axis. For instance, if A B, be part of the axis of a screw, C D, a part of its thread, B D, at right angles to A B.



Then, as in theoretical calculations of the resistance of fluids, the resistance arising from *inertia* is alone considered, if the screw were to revolve until C arrived at E, in the straight line D F, parallel to A B, any particle of water which was resting upon D, when the motion commenced, will be driven along by the action of C D, upon it, from D to E. When the screw does not move from its position, D E, is moreover equal to A B.

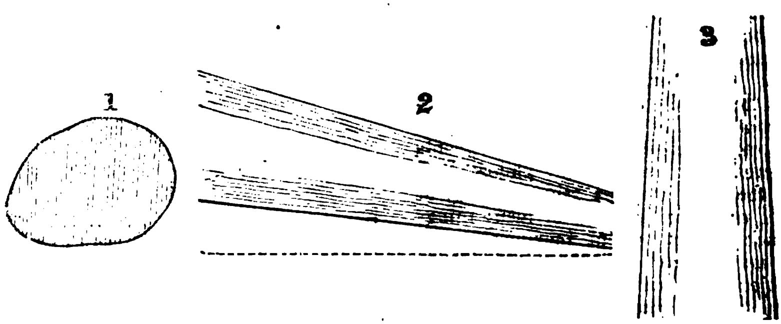
The *whole* power therefore, theoretically, would be directly exerted to move any floating body to which the screw might be attached in the direction A B. The resistance overcome by a screw of one turn is, in every revolution, equal to that overcome by a circular disc of an area equal to the area of the base of a

correspondent cylinder, minus the area of the axis of the screw, moving in the same fluid in a direction perpendicular to its surface, a distance in an equal time, equal to the length of the screw's axis. For instance, the axis of the screw of the *Archimedes* is parallel with the line of the vessel's keel, the resistance being overcome perpendicular to a plane at right angles with the axis, the whole power is directly exerted in the line of required motion: the result is, as if a circular disc of about 24 square feet were forced by the water in a direction perpendicular to its surface, a distance of 8 feet in the time required for one revolution of the screw, and *were there no slip*, the vessel would be propelled a distance of 8 feet by every revolution of the screw.

2. Practically there is nothing that can materially interfere with the foregoing deductions. There is no assignable cohesion among themselves of the particles of water; what there is, must in some trifling degree create a loss of power. Their cohesion to the surface of the thread of the screw, a cohesion increasing with the velocity of revolution, will add indeed to the weight of the screw, and to the amount of friction to be overcome, but will not affect the direction in which resistance operates. There would be communicated to the water thrown off a conical twirl, such as Captain Chappell has noticed, though I believe the divergence would be of very limited extent.

The difference of resistance offered to pressure upon a particle of water at any point upon the surface of the thread, has nothing whatever to do with the direction in which resistance is overcome; but there must be in consequence a lifting of the water moved, nearly equal to the diameter of the screw, keeping the posterior portion of the screw covered when above the level of the water's surface, thus aiding the continuance of its action on the ship.

Could we see the water thrown off, I imagine, from an attentive consideration of the several laws acting upon it, that there would be the following aqueous appearances.



1. As seen end on. 2. As seen sideways. 3. As seen from above.

3. So far from cutting away the inner parts of the screw, the only question seems to me to be *how far are the outer parts necessary?* If, for instance, two paddles or floats of a wheel of 12 feet diameter (which it seems is the size of wheel proper for the *Archimedes*,) are only of 14 or 15 feet area, it is probable the outer positions of the screw's thread might be advantageously cut away until the diameter is reduced to 4 feet 5 inches, the outer parts of the thread making an angle of 58 degrees with the axis.

4. Apart from its necessary connexion with the length of axis it does not seem to me that the angle which the thread makes with the axis can be very material. It is probable that further experience will show the propriety of varying the angle according to circumstances, since the same angle which might best suit for tug boats or ships of heavy burthen, may not be equally adapted to sharper vessels intended to proceed at higher speed. It is quite amusing to find Mr. Holebrook taxing captain Chappell with error, for stating the angle at 45 degrees, when the least reflection might have rendered it evident that Captain Chappell was speaking of the angle made by the *mean part* of the thread, and not of its *extremity*. The greater

the length of axis in one turn the less of course would be the angle, and *vice versâ;* but the less the length of axis, the greater the velocity of revolution necessary to drive the ship a given distance in a given time, and consequently the greater would be the cohesion. I do not conceive it would be advisable to go to a greater velocity than 170 revolutions per minute, but such a point, as well as the length and the angle, can only be decided by experience, and not by theory.

5. Mr. Holebrook seems to have theorised himself into sad confusion upon the subject of *slip*. A screw of one turn cannot advance more than the length of its axis in one revolution by any motion of its own creation; but Mr. Holebrook endeavours to persuade us, that as the outer portions of the screw of the *Archimedes* go through a space of 24½ miles per hour, in the average number of revolutions made by the propeller, the vessel would also advance that distance in a straight line if there were no loss of power. The absurdity of this hypothesis is manifest. Multiply the hourly number of revolutions 8,320 by the length of axis 8, and the amount gives the utmost attainable speed if there were no slip 10.9 nautical miles. Now in the tabular statement given in Captain Chappell's Report (which by the way is drawn up in a manner highly creditable to that officer, and peculiarly gratifying to any one desirous of information from the clearness of its arrangement,) we find that the *Archimedes* made an average speed of 8.8 miles an hour, consequently the slip is something less than *one-fifth.*

6. Mr. Holebrook cannot discover how the action of the screw should alter the position of the ship's head some points previous to her getting way, a fact attested by several most respectable and disinterested witnesses. Had Mr. Holebrook possessed the slightest knowledge of maritime affairs, he would have understood that the circumstance in question was occasioned simply by the rudder being inclined to port or starboard, at an angle with the keel, so that the stream of water thrown aft by the action of the screw, impinges upon the rudder, and thus acts as a lever upon the stern of the ship. If Mr. Holebrook's theory were correct, the fluid would never be driven near the rudder by the action of the screw, much less forced thus violently against it. The statement I have made, however, accounts for the result, as mentioned by Captain Chappell and many other naval officers, showing that resistance being overcome in a direction nearly parallel with the vessel's keel, and with the axis of the screw, the water will be driven nearly in a direct line astern, and with great violence.

7. It is asked, "might not paddle-wheels of 12 feet diameter with the same steam engine, drive the ship as fast as she goes with the screw, the wheels making 25 revolutions per minute?" I answer decidedly not. For the greatest possible distance a wheel can travel in a straight line when revolving, is equal to the length of its circumference; and unless it be dragged along it cannot go more: therefore, a vessel cannot be propelled by paddle-wheels a greater distance in 25 revolutions, than 25 times their circumference, which would give a possible distance of only 9.2 miles per hour, and estimating the slip at one-fifth, the *Archimedes* could not have gone more with paddle-wheels than 7.4 miles an hour, which is 1.4 mile per hour less than she was propelled by the screw.

Upon due consideration of all these points, therefore, it is evident—

1. That *there is scarcely any practically material loss of power arising from the action of the screw.*

2. That *the action of the screw is not only direct, but constant.*

3. That *there never can be such unequal lateral action as to shake the ship's heel, or to cause gyrations of her head,* as supposed by Mr. Holebrook.

4. That *the slip of the screw is less than one-fifth.*

5. That *the vessel goes considerably faster with the screw than the same steam engine would drive her with paddle-wheels.* Besides the wheels only act directly at one point; one is often immersed too much, and the other altogether out of the water; and both are occasionally immersed too much or too little, as the vessel may happen to be heavily or lightly laden.

In opposition to all these manifest advantages, added to those so clearly described by Captain Chappell, there is but one objection which appears to me of any force. Is not the orifice made in

the dead wood for receiving the screw, likely to weaken the stern frame of the ship? It is reported that several able ship builders have already submitted plans to Captain Chappell for obviating this objection, and "being a mere mechanical difficulty" it will probably be overcome; but as I had no other object in penning these observations than to elucidate truth, it would not have been consistent with such purpose to omit noticing any particular upon which I entertained a doubt.

The probability of a steam vessel ever being in a position in which a shot could strike the screw propeller is extremely slight, for a gun which could project a shot, so as to strike an object possibly at a depth of 12 or 14 feet under water, must I conceive be mounted upon a considerable elevation above the level of the sea, and be likewise in close proximity to the vessel. If it were not so elevated and so near, it could not be depressed so as to admit of the shot penetrating to the depth of the screw; so that, practically, Captain Chappell is correct in stating, that the propeller would be secure against shot, as circumstances could scarcely ever concur to place a vessel in such a situation as I have described. If Mr. Holebrook had thoroughly comprehended the system of *ricochet* practice, frequently adopted by the French during the late wars, he would not have presumed to question this opinion of so distinguished an officer as Captain Chappell, whose professional services must have made him more conversant with the principles of gunnery, than a mere landsman like Mr. Holebrook.

Finally, I must express a full conviction that the screw is in every point superior to paddle-wheels for the purpose of propelling a body in a fluid. Its collateral advantages also are so numerous, that it cannot be long before it comes into general use. One of the first engineers of this great engineering country has already declared in favour of Mr. Smith's invention. Ships of immense magnitude are adopting the principle in all directions; and notwithstanding the interested opposition of paddle-wheel projectors, or the *anonymous* fabrications of envious persons, it would be as easy for Dame Partington to stop an inundation of the Atlantic with her mop, as for the "small fry" in question to stay the progress of an invention, which will probably soon be ranked side by side with some of the greatest improvements introduced by the transcendant genius of WATT.

I remain, Mr. Editor, your obedient servant, and constant reader,

ROGER PHILLIPS.

Whitehaven, October 10, 1840.

IMPROVEMENTS IN BELL HANGING.

Sir,—The desire you evince to publish all things useful in your valuable periodical, encourages me to suggest, what I think would be an improvement in dwelling-houses. When the plasterer has done his part, the bell-hanger is usually called in to spoil his work, by making ragged unsightly holes, through which to conduct his wires. This is done by punches and long gimblets, to force passages through the walls, floors and ceilings, which are often so large, as to admit two or three fingers. Indeed, there was an instance some few years since in the environs of Liverpool, of much alarm being excited by the bells ringing without any apparent cause, till the discovery was made, of its being occasioned by mice passing through these convenient openings on visits to each other in their separate appartments. A very simple and neat contrivance might prevent all this, at a light expense, viz.: to insert in the brick work, in each corner where bells may probably be wanted, small tin or zinc tubes, not exceeding ¼ inch bore. The expense would not be half-crown a house, the tubes might be easily cut off to any length, and be no eye-sore in any case. It would abridge the labour of the bell-hanger in the most disagreeable part of his work, where he has frequently to encounter a hard brick. The communication would be ready made to his hand by the brick-setters in an early stage, and the tubes plugged up where not wanted.

I remain, &c.

C. G.

Moville, Donegal, October 1, 1840.

TO CORRECT A SQUARE.

Take a square plate as broad as the square to be corrected is long. Apply the square to one edge, which mark, that

you may know it, and call it the first. Alter the second edge till it fills the square exactly, then apply the square to it and alter the third, which, being made correct, apply the square and make the fourth correspond unto it. Having thus made the four sides of the plate answer the square at the three corners, apply it to the fourth, when it will at once prove a true test of the correctness of the square. If on applying the square to the fourth corner, it answers without deviation to the fourth side and the first, it is an evident proof that the square is delicately true, since whatever deviation is manifested it is four times the real error of the square. This is evident, since each repeated application of the square adds its own error to the former.

Let those then, who have tested their squares by this method, alter their squares a fourth of the deviation, shown at the fourth corner. To come to the utmost exactness, they must repeat the operation as before described, till the plate corresponds with the square at every side, and the square with the plate at every corner. It is almost needless to state, that the operation must be performed by a good workman and with the greatest exactness. If the square to be tried be large, the square plate need not be solid, but made like a frame, which, having been made delicately true by the foregoing method, might be carefully preserved, and would serve as a true test by which to regulate all squares of smaller dimensions.

I have known some persons say that it was impossible to make a plate square, or to answer a square on every side, not considering that the deviation shown on applying the square to the fourth angle, having made it fit the other three, is owing to the incorrectness of the square itself, and not to the impossibility of performing the operation.

I remain, &c.

T. B. Darlington.

September 26, 1840.

SUBMARINE GALVANIC BATTERIES.

Sir,—Giving all due credit to Colonel Pasley for his use of the galvanic explosion of gunpowder under water, I would suggest, that instead of wasting so much powder as his plan must do—that a submarine battery consisting of guns of sufficient calibre should be substituted, whereby much more execution would be done, and certainly with much less danger. I need not say that the powder of the battery could be galvanically fired quite as easily as in the manner the Colonel at present uses it.

To show that this suggestion is feasible, I would observe that a solid substance forcibly projected against the materials intended to be dissevered would be much more effective than mere force of expansive matter, which can only be but very partially applied, as it must radiate in every direction.

Such a plan of using submarine explosions by means of guns or batteries placed vertically or otherwise, as occasion might be, would afford an excellent means of defence against vessels of war entering a port or harbour with hostile intention. It is free also from the objections advanced against the treacherous torpedo system proposed by the American Fulton, as it could only when it took effect, hasten the surrender of the approaching enemy. *

THE CALCULATOR, No. 10—CASK GAUGING.

Sir,—Your correspondent, "Nautilus" (p. 263) has certainly produced a very simple rule, which I am not prepared to say is not as good as, or for practice better than, that suggested by me. The *test* of experiment is alone applicable to a thing so arbitrary in its formation as a cask.

A theoretical objection, however, is this; that upon the supposition of B and H being equal, "Nautilus's" rule will give *less* than the true cylindrical content. Putting it into my general form, the values of x y z come out 1·9064, 1·05911 and 0 respectively; this sum falling short of 3, by 0·03449. And if the divisor 1000 be retained, it will make the co-efficient wanting = 0.03257, to be applied either to the product B H, or to some function of one or both of the separate quantities. In the particular example chosen by "Nautilus," the addition of a term ·00003257 L H² would bring the capacity almost exactly to the actual measurement; while that of ·00003257 L B H would make the content about *half as much* in excess, as without it, in defect.

In the Calculator, No. 7, I stated such

co-efficients as appeared best to satisfy Dr. Young's measurements collectively. But were it worth the trouble, I have little doubt that more than one equally good set of co-efficients might be found by trials; and the question then would be, which set, taking the experiments singly, as well as collectively, agreed best upon the whole. According to established mathematical principles, that by which the *sum of the squares* of the errors was least, would be entitled to the preference. And I may remark, that from the results exhibited by "Nautilus," it appears clearly that my formula would by that test have the superiority over his.

On the second part of "N.'s" letter, I have only to say, that I entirely approve of his mode of tabulating—a mode which is equally applicable to both our formulæ. My observation in the paper last quoted, ought to have been qualified thus—"Such table, *if not of double entry*, must consist of three parts," &c.

J. W. Woollgar.

Lewes, October 10, 1840.

HINT FOR THE IMPROVEMENT OF OMNIBUSES.

Sir,—It would be a great advantage to all, and especially to those at the far end of an omnibus, particularly if timid and shy, if a check string, running on two or three little wheels along the middle of the roof were fastened at one end to the far end of the omnibus; and at the other to a knocker by the guard's elbow; so that by a person's pressing the string downwards, the knocker would be raised. The moment the pressure was removed, the knocker would fall; thus apprising the guard that somebody wished to get out, instead of, as now, communicating this to those near the door—a tedious, and to many, an unpleasant thing.

I remain, &c.

E. M.

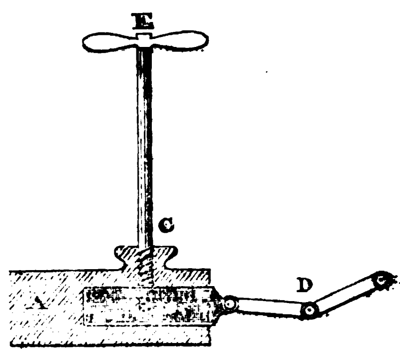
Monday.

[The sound of a knocker assimilates too nearly to those by which the omnibus is environed; a bell so placed, (a suggestion already noticed in our pages, and in one or more cases actually adopted) is decidedly preferable. Ed. M. M.]

RAILWAY CARRIAGE LINKER.

Sir,—I herewith send you a rough sketch of a linker or joiner for railway carriages, by means of which they may be so linked or joined together, as to be instantly detached in case of danger. It is especially adapted for the first or second carriage of a train; so that in case any accident should happen to the engine, the connection between the engine and train may be easily dissevered. It is not my object to stop the engine, or prevent its going off the line of railway; my object is only to prevent the carriages following it, whereby the passengers may be preserved uninjured.

I will therefore proceed to show the simple method that I think might be adopted to accomplish this without risk.



A is a box of metal forming part of, or attached to the frame of the carriage.

B, a quadrangular piece of iron just fitting into the box A, and securely held therein by the screw rod C.

D are the links for making the connection between the first carriage of the train and the engine.

Let us suppose a train going at its full speed, and all of a sudden the engine runs or is thrown off the railway; the conductor (if he is on the look out, as he always ought to be,) has nothing more to do than to turn the handle E of the screw C, once or twice round, which instantly detaches the engine from the carriages; the engine drawing the sliding piece of the linker or joiner out of its box, proceeds in its dangerous career, leaving the carriages to follow at a moderate speed, which may soon be entirely stopped by the application of the brake.

This same plan, I think, might be ad-

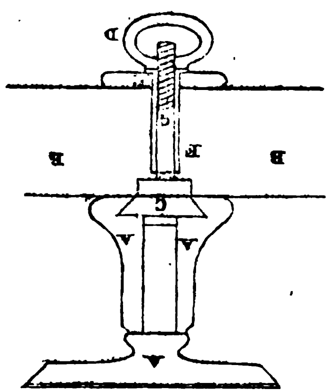
vantageously used on the London and Birmingham Railway (where a rope is now employed to draw the carriages up the inclined plane from Euston Square to the Camden Town Station.) The present is a most awkward make-shift way, dangerous to those employed, and altogether un-mechanical and un-workmanlike.

If you think the communication worth a place in your valuable pages, its insertion will not only oblige me, but I hope also serve the public.

I am, Sir,
Your obedient servant,
G. C.

Camden Town, August 19, 1840.

USEFUL APPENDAGE TO LATHES.



Sir,—I have forwarded you a sketch of a plan I have for some time adopted for preventing the chips and turnings which are continually falling through a lathe bed when at work, from getting into the lower set screws, either of rests or centre puppets, and with which the screws are continually clogged and (if the turnings are metal) injured; much force too being required to set the rest firmly down on the lathe bed, and if oil is applied, the evil being increased by the shavings adhering more readily. The remedy I have made use of is simple and effectual. Into the plate E (mine is circular) which slides under the bed, and through which the screw G passes, a piece of brass pipe is driven tight, and rivetted on the lower face a little countersunk, which pipe is sufficiently large to allow the screw G to be moved easily up or down, and of such a length as to be within an eighth of an inch of the shoulder of the dovetail slide C, when the rest is fixed firmly by the set screw. The shoulder of the dovetail slide C should be turned to fit the opening of the bed, so that there may be no possibility of twisting the pipe out of the perpendicular, when shifting the position of the rest either forwards or backwards. Oil may be then applied to the screw and shoulder, which will then work with the greatest ease and dispatch. The shavings in falling are prevented entering into the pipe by its proximity to the shoulder C. Should the shoulder, however be too narrow to prevent them altogether from getting into the pipe, the end of the pipe may be carried a short distance up the shoulder, which would entirely prevent any access of dirt, &c.

Should the above have any claims to novelty, by extending the application of the same, through your valuable Magazine, you will much oblige,

Your obedient servant,
AN AMATEUR.

Maidstone, September 24, 1840.

CUPOLA FOR REMELTING IRON.

Sir,—As I am on the point of erecting a cupola for *remelting* iron, and wish it constructed on the best and most economical plan, perhaps some of your correspondents would favour me, (and which would be of great use to other iron-founders,) with a sketch of one that would melt iron at the rate of six or seven tons per hour.

Though I am not aware of hot air having been fairly tried for the purpose of *remelting* iron, I should think it would answer well. I have a fan-blowing machine 4 feet diameter, and mean to make it revolve 2,400 times per minute.

I am, Sir, yours truly,
R. G.

October 5, 1840.

PRESEVARTION OF SHIP TIMBER.

Report of the Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic

Arts, to whom was referred for examination the propriety of the substitution of Lime for Salt, as a preservative for Ships: Report—

That they are called upon to regret that only a few facts could be brought to bear upon the question, and that the experience of others, as ascertained by an examination of approved works on the preservation of timber, is so limited, as not to permit of their giving a decided answer relative to the beneficial or the injurious effects of lime when used in the manner proposed. The effect of strong caustic alkali upon wood has been a subject of experiment, and resulted in the complete destruction or solution of the ligneous matter;* but it has been applied in a more diluted state with advantage, to remove and prevent the formation of fungus. The effects produced on vats in which caustic lye is made for domestic purposes, are to soften the texture of the wood in such a manner that the surface and even the interior to a short depth, may be peeled off in long and slender fibres when moist, or in shorter fibres when dry. There are no evidences of decay similar to that arising from rot, but it seems as if the substance cementing the fibres was removed by the alkali, while they are not influenced by it. This wood when dry is more flexible and less elastic, and its surface at least appears to be much lighter from the removal of a portion of matter. It has consequently a diminished hardness.

From the alkaline properties of lime we might infer a similarity in its action to potassa; an inference confirmed by observation. Wood covered or coated with lime in a moist or dry situation undergoes a similar change externally. There is no appearance of decay, but the fibres may be peeled off, the surface is lighter, softer, more flexible, and less elastic. These effects then are similar to those above noticed, excepting that they are exhibited in a diminished degree, for the action does not take place to the same depth, nor can the external fibres be removed with the same readiness. When in contact with alkaline substance, the wood does not appear to undergo farther change than that which has been described, but if the contact were broken there can be little doubt that it might be more readily injured by rot, from th softness of texture it has acquired, unless indeed it has become so impregnated as to obviate decomposing influences. The employment of lime, therefore, may be recommended as a preservative of timber, an opinion strengthened by the experience of ages.

But again, it becomes a question of importance to determine the state of the lime most favourable to its powers of preservation, for it is asserted that where wood remains a length of time in contact with quick lime and water, it suffers a more rapid decomposition than under ordinary circumstances. On the other hand, where wood is frequently washed with a coating of lime, suffering a short space of time to elapse between the several applications, the wood is not only perfectly preserved, but often becomes so hard as to blunt the teeth of a saw. In this case, it has become partially carbonated, including even that portion which has penetrated the wood. It would therefore appear to be more advisable, if lime should be substituted for salt in the case proposed, to employ it in a partially carbonated state, which may be attained by slacking quick-lime with a quantity of water, just sufficient to convert it into fine powder and then spreading it on any convenient surface for several weeks prior to its application, in order that it may absorb carbonic acid from the atmosphere.

But in the case referred to, there can be no doubt that a portion of the lime will be in contact with salt water. Can any injurious effect arise from this circumstance? The committee are of opinion that it cannot; for although a portion might be converted into muriate of lime under certain circumstances, the probability is that that portion would be small, and not capable of materially affecting the wood, even supposing it should do so injuriously, which the committee have no ground for believing.

Again, to an objection proposed, that lime might generate heat, it may be answered, that lime is known to combine with only one atom or 24 per cent. of water, forming the hydrate of lime (slacked lime) and that only during its combination does it evolve caloric; and since it is proposed to employ it in a slacked condition, this objection may be unhesitatingly set aside.

* Ure's Dictionary, art. Wood.

The presence of muriate of magnesia, in common salt, which is the material ordinarily employed for filling the spaces in the sides of a ship, by its strong affinity for water tends to keep the salt constantly in a moistened state and probably communicates no inconsiderable quantity of dampness to the vessel. It is highly probable that the lime would obviate this difficulty from its drying quality. The purifying effects of lime are also well known, and it is not an uncommon practice in the warmer climates of Europe to wash the interior of a ship to prevent and free it from contagion.

To compare the two substances together, it may be stated that salt hardens, while lime rather softens the external parts of wood where they are in contact with it, while both tend to prevent the rot, or the attack of insects; that the salt probably tends to keep the atmosphere of a vessel damp, which lime would not; that the lime will tend more to purify the air than the salt; that lime has a less specific gravity than salt, and is to be preferred on that account.

The committee, therefore, can perceive no ground of objection to the substitution of slacked lime for salt, for filling the interstices of the sides of a ship, particularly if employed in a partially carbonated state; while at the same time where so much interest is at stake in answering the question, the limited information on the subject which they possess will not allow them to give a decided opinion. In conclusion, they would request those who have observed facts, or acquired information, relative to effects of lime on wood under any circumstances, to communicate them to the Institute, in order that they may be brought before the public.

By order of the Committee,

WILLIAM HAMILTON, Actuary.

Philadelphia, June 11, 1840.

—*Journal of the Franklin Institute.*

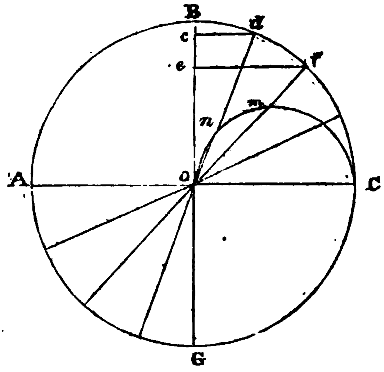
ON LONG AND SHORT-STROKE ENGINES AND THE LOSS OF POWER IN CRANK MOVEMENTS.

Sir,—In the article taken from Mr. Seaward's pamphlet to be seen in your last months' Magazine, page 198, there is a statement to the effect that no arrangement of long or short connecting rods in steam machinery or any crank movements can either increase or diminish the effective power of the piston rod, and there is a table annexed, in which the total leverage of the crank with two connecting rods of unequal length is shown to be equal. Now, this table contradicts the statement above made, for it gives the leverage when the crank is at right angles to the vertical line, and of course the connecting rod making an angle with that line at 1000, which could not possibly be the case unless that rod was of infinite length (and this is shown by the same table to be the case by the difference in the leverage given in the table in the three positions of the crank at angles of 90, 100, and 110 degrees,) as the effective power of the piston rod in the direct vertical line, is assumed to be only equal to that number. Or to take another view of the matter, as the table is calculated for the case where the connecting rod is below the crank, how does it happen that when the crank is at right angles to the connecting rod, the power is increased beyond the assumed quantity? How the power is increased under these circumstances, is a question much easier to ask than to be satisfactorily answered. The only reply that can be given is that the tables are calculated erroneously. Again, the leverage of both long and short connecting rods at 90 degrees, appears to be the same in both columns, notwithstanding the difference of the angles which the rods make with the crank, and the table shows a variation in the leverage, where less variation takes place in the angles.

There is also an error in the statement, and it is a very common one made on this subject, that the leverage of the crank represented by the sines of the angles, gives the power to turn the crank at that angle. Now, this is not correct—it only gives the number that carries the lever at that point to equilibrate. The whole matter in dispute between those who contend for a loss of power in the crank and their adversaries, depends on this point; it will therefore be necessary to go a little more into particulars.

Let the circle A B C G, represent the circle made by the crank, the lines C *d*, and *e f*, and *n m*, represent the sines of the angles at the points *d* and *f*.

Take C d in the compasses, and from o the centre of the circle towards d make



o n equal C d,—o m, equal e f, and through the points o, n, m, then draw the curve line o n m C. It can be proved that the curve which passes through these points is a semicircle, and therefore the length o n m C, bears the same proportion to the radius o C, as 1.5707 is to 1, but the quadrant B C, has also the same proportion to that line; therefore, these two lines B d, f C, and o n m C, are both equal in length, and therefore o n m C, is equal to the quadrant C B.

The obstacle opposed to the turning of the crank is represented by a weight suspended by a line passing round the axle; as the spaces therefore passed over by the extremities of the variable levers o, n, o, m, &c., represented by the line o n m, is equal to the spaces passed over in the same time by the other extremity of the lever at A, namely, A, B, we can represent the time by a line passing round both these curves; so that if we have a weight suspended from a line passing round the axle, we must have the power represented by a weight also suspended from a line passing round the semicircle o n m C, but this will make the power move through a space greater than what the piston rod of the engine moves (which is only from B, to C,) in the proportion which the circumference of a circle bears to its diameter; therefore, although the sines of the angles represent what will equilibrate the levers at each angle, yet the weight represented by the average leverage to be overcome, cannot move over a greater space than the diameter of the circle B, G; it will therefore be necessary to enable the same power to move it through the larger space, or what is the same thing, to turn the crank, that the weight which represents the average leverage as aforesaid, should be diminished accordingly, in the same proportion. The difference in the weights will be the loss sustained by making use of the crank, and this will be found to be about one-third of the power.

There has been a good deal of observation made in your publication to the effect that the doctrine here contended for interferes with the theory of vertical velocity; but I contend that the arguments here made use of, are by no means opposed to that doctrine, but on the contrary, are in support of it, which a very little attention to the subject would make manifest.

I am, Sir, your's, &c.

M.

REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS APPOINTED 7th FEB. 1840, TO ENQUIRE INTO THE EXPEDIENCY OF EXTENDING COPYRIGHT OF DESIGNS.

(Continued from page 394.)

Mr. William Ross, of the firm of Potter and Ross, resides at Pendleton, near Manchester. Is engaged in calico printing at Over Darwen, about 20 miles from Manchester. Has the honour of being vice-president of the Salford Mechanics' Institution. Has been in the trade about 19 years. Takes a very active part in superintending the printing department of the works; he generally goes down once a week to the works, and the business is so organised, that he has every morning a statistical account of what has been done at the works the previous day. Has considered the subject of the extension of the term of copyright of designs with deep attention. Thinks an extension of the term of three months' copyright is neither necessary nor desirable. With respect to the extension to six or twelve months on the home trade, thinks it is a question of degree; six months would be a less evil than 12 months; thinks an extension of time uncalled for, and dangerous as respects the home trade; as respects the foreign trade, it is his decided conviction that it would be extremely injurious. Considers the present term of three months' copyright a sufficient protection for the home as well as the foreign trade of the country. Is decidedly of opinion that the proposed extension would have the effect of

inducing the foreign calico printers to copy English patterns. Has had one of his own patterns copied abroad; the goods were confined to a German house. By confined he means engaged. He entered into an engagement with one house to sell it exclusively for that market, which was a German market. The goods went out, and afterwards the pattern was transmitted to Manchester; was engraved by the very person that witness had employed to engrave his pattern, and he has no doubt whatever with the very same machinery; the rollers were sent with great despatch abroad, and the goods were produced with so much rapidity in the German market, that witness was undersold considerably. The party to whom he sent the goods supposed that he had violated his engagement. He informed them he had not done so. It turned out that his engraver had executed the pattern for the foreign house, and it was owing to his re-engraving the pattern and sending it out to that house, that witness's customer abroad was undersold considerably; should say 15 or 20 per cent—he said he was very considerably undersold. That was by a foreign calico printer, who had printed from that engraving in Germany an exact facsimile of the pattern, which was composed of two parts. It was a covered pattern, done by machinery, very cheap; what they term a blotch by a roller; there was a cover thrown over it, and both the cover and the blotch ground were copied; they were fac-similes, and they were, in my opinion, done by the very machinery that had produced my own. They sold the article referred to at their ordinary rate of profit. Is convinced that such occurrences would be much more frequent if the copyright was extended. Thinks that an extension of copyright would be the means of giving encouragement to foreign calico printers; thinks it would have decidedly that effect, because when it was known abroad that prints here were bolstered up in price (for an extension of the copyright would, in his opinion, be attended with an increase of price), and that no one could meddle with patterns till the expiration of twelve months; this state of things would operate as a bounty to our foreign rivals to copy us. Is of opinion that the object of obtaining an extension of copyright is to obtain an increase of profit and an increase of prices for the goods. Is of opinion that if an extension of the copyright were to take place, by means of which larger profits were obtained, the patterns being protected in this country would be sent to some foreign calico printer, to be by him copied and sent to neutral markets, in competition. It is his opinion that that would be the effect. Does not know what patterns would be sent; probably agents might be established in Manchester; knows that agents are established at present by our foreign rivals; at least hears so from undoubted authority. That is, agents from foreign markets employed to get patterns engraved here. Has never availed himself of the present protection afforded by law; has always found that energy and prudence in business were the best protection. Putting a moderate price upon his prints, he has been enabled to sell a larger quantity; and possibly he has made a larger profit than those who have protected themselves, and obtained a higher price. He might give a case in point: he brought out a style this Spring, and that style has been copied, but by activity he was enabled to bring 6,000 pieces into the market before the copier could get copies effected. Thinks that the most efficient protection against a copyist is to produce the article as cheap as it is possible, and to sell it at a moderate profit, and that protection he has considered the most efficient in conducting his business. Is not in the habit of copying the patterns of English calico printers—it is not at all his practice to copy. Thinks there are no houses it is less attributed to than to his. He gets ideas from French patterns, and he may copy portions of them; endeavours to combine new patterns from French ideas; sometimes he may copy them exactly, but not so frequently; his patterns are the result of combination. With respect to French patterns, knows it to be the regular practice of the Lancashire calico printers generally to obtain a supply regular; thinks they are sent to 20 houses at the same time, the very same patterns, and very likely sent by the same agent. A great many of them have an agent in Paris, and when patterns come out, they are regularly transmitted by post, and to all parties by the same post. The agent would be considered as acting unjustly if he did not transmit them to each house on the same day. We employ our own designer; has but one designer; the patterns are produced entirely by witness, the designer only executes the ideas which he gives him. There has been in witness's opinion a great waste of money in the production of patterns by many houses; some parties think the business cannot be properly conducted unless they have three or four designers—houses whose productions are not greater than his own; they give them ideas, and they say you must draw us something in this or that style; but unless properly conducted, it proves a failure. If the designing department be properly conducted, it may be brought within a very small cost. Cannot tell how many patterns he produces in his business annually, has never noticed the number; has always kept his eye upon the cost of producing the patterns; but he engraves the greater number of the patterns that he draws. Has actually calculated the

cost of designing: the average cost is about ⅘ths of a penny per piece. Witness is aware that it is the practice of some engravers to send patterns abroad to obtain orders to re-engrave them for the foreign markets. Has undoubted testimony that such is the practice—the testimony of Mr. Lockett; it was him that copied witness's pattern for the foreigner. To the best of witness's recollection his pattern was copied within the three months. It was the first order that had gone out; the pattern was promptly copied. Upon being informed that his pattern had been copied, he applied to know if Mr. Lockett had been instrumental in that copying. Mr. Lockett confessed that he had copied it for the foreigner, but did not think the copying would interfere with us. Witness told him that it had interfered very materially, and that his feelings were much hurt, because it might have led the party to suppose (though he was perfectly satisfied with his explanation) that he had broken his engagement, and that hurt witness more than the loss of money. Will not say it would be desirable to have no law of copyright at all; admits the principle of protection: it is to the degree that he objects. If there had been no law of copyright at all, all this might have happened. But if it were known to the foreigner that patterns in this country were protected for 12 months, having copied one successfully, he would copy another; but without the protection, they would be copied by a pirate, as he is called here in England, and he would send the goods out on a common cloth, and undersell the foreigner, and stop him from practising copying again. Does not think it extraordinary that in his nine years' experience his patterns have only been copied in one instance, because he brings his own goods out at so low a price as to prevent parties from copying. It is true the German copyist undersold him by 20 per cent: does not attribute that to the cost of the pattern; it was the difference of duty that enabled him to do so. Having copied the pattern, he was enabled to undersell the party who had paid a duty on the goods. If the term of copyright is extended, higher prices generally will be got for prints by those who avail themselves of the protection; and a further stimulus will be held out to foreigners to copy our productions. Is not prepared to say if he should avail himself of an extended protection; should see how it worked; if he could advantageously avail himself of it he should. Has always found that those who availed themselves of the law in its present shape have asked very exorbitant prices; they have sold fewer goods, but they have asked very high prices. The houses that protect their goods make larger profits in the aggregate upon their business than those houses which do not protect them. Is aware that 12 months' copyright exists in France, and it operates in that country—to the best of witness's knowledge, and according to the best testimony he has consulted—in this way; their taste seems to increase, but whether to attribute it to the law he cannot say; thinks that the French are naturally a people more inclined to taste than the English; but though more advanced in taste, they are by no means equal to us in economy in the cost of production; though the French have advanced so far in design, they have not advanced so much in the operative part; they cannot print styles by machinery that we print; and it is witness's firm conviction, after being 18 years in the trade, that we never should have been in the situation we are, as regards the print trade (for few trades have progressed so rapidly), had we had a 12 months' protection. The French have a machine called Perrotine, invented by M. Perrot, of Rouen, and intended to supplant our four-coloured machine, but there is no chance of its doing so; it is on sale in this country, but witness cares nothing for it; we can produce by our four-coloured machine styles at a much cheaper rate than can be produced by the Perrotine. Is of opinion that free competition in the trade has advanced printing to its present point. Although the French calico printers do not at the present time adopt our economical system of producing, thinks they will by degrees get more into our way; and, having a great superiority over us in designs, if they were to adopt the same economical means that we do they would then enter into a much closer competition with us. The French are progressing in economy of production, but they are protected for 12 months; and the consequence is that the English copy their patterns, and undersell them in neutral markets. At present they are superior to us in design, and we are decidedly superior to them in machinery. Thinks the 12 months' protection that now exists in France encourages to a great degree the copying of their patterns in this and other countries. If their copyright was limited to 3 months, like ours, much greater activity would take place in their trade, and there would be less copying of their patterns in this country; competition would compel greater activity. Thinks that if the law of copyright had been altered, as it is, now proposed to 12 months, 10 years ago, the trade would certainly not have been in as favourable a position as it now is. In that case the block printing would in all probability have continued the main branch of the business; it would have formed a much more important part than it does at present. Thinks block printing is likely to diminish, because machinery is advancing daily. Machinery

is a much cheaper mode of producing than by blocks. There are constantly new inventions making for the improvement of machinery; indeed it is surprising, when a person looks back 10 years and sees the rapid progress that has been made in this country in calico printing: we can print now what we could not print then, and we can produce styles at a greatly diminished cost to what we could then. Thinks it is wrong for himself or others to avail themselves of another person's ingenuity and skill; has a moral objection to copying patterns. It is unquestionably the duty of the law to protect other parties from the same immoral conduct; from his experience in the trade, it is his conviction that the application of the law in this case requires very delicate adjustment, and that the protection may be beneficial or otherwise, according to the degree. His objection to an extension of copyright is the impossibility of enforcing the law; that is his main objection, as it respects the home trade. Has had a great many of his patterns copied, but there is not so much copying now as formerly. If by "originality" something entirely new is meant, there is very little originality, and consequently very little copying; but if approximations to patterns be called copying—if taking styles be called copying—then he should say there is a great deal of imitation of styles. You have no chance of trade but by following the style, whatever i may be. Copyright does not profess to protect styles; it only professes to protect patterns. In the legitimate sense of the word "pattern," there is not much copying. There is much competition in originality, in the legitimate sense of the word "original." In the present state of the law the amount of that competition is a sufficient check upon any attempt at exorbitant profits. Thinks if we had an extended copyright there would be less originality—we should not have the number of new patterns that we now have, because parties knowing that they were protected would say, "I have no need to go to great expense; I have no need to bring out a repeated succession of new patterns; I am protected for 12 months; my patterns cannot be touched, and I will go on working them." Is convinced there would be no necessity for producing such a variety. Under a twelvemonths' copyright there would be a general disposition to work patterns for 12 months, without producing new ones to the extent they now do. There is a great demand for novelty, both in the home market and the foreign; and there is a rapid succession of new patterns, which is found to be advantageous. He had some idea of availing himself of the present copyright, and regrets he did not do so this spring. He is not inimical to the present copyright. It is a fact undoubtedly that the production of novelty on their part is in consequence of a demand for novelty on the part of the public. Thinks that the obtaining an extension of the copyright to 12 months can have no other object in view by those who are seeking it, than to enable them to work their patterns a longer time, and to obtain higher prices for their goods.

(*To be concluded in our next.*)

MR. HALL'S EXPERIMENTS IN CONDENSATION OF STEAM.

Sir,—My attention having been called to a controversy in the *Mechanics' Magazine* respecting the merits of Mr. Samuel Hall's patent condensers, in which Mr. Symington's and Mr. Howard's methods of condensation are alluded to, I am induced to give you some information which may be of use to your correspondents in their future discussions, and prevent their running (if you will excuse my saying so) into as great errors respecting the latter methods of condensation as they have fallen into regarding the former. Allow me, with this object in view, to say that there is one important matter that must not be overlooked, which must inevitably render Mr. Symington's, as well as Mr. Howard's, methods of condensation abortive, while Mr. Hall's method, as ample experience has shown, is quite perfect. The case is simply this: in a pair of engines of 200 horses power, Mr. Hall, by his method, has only about 13 gallons of water per minute (viz., that which results from the condensation of the steam) to cool, by means of metallic surfaces, to the degree required not to injure a vacuum; whereas Mr. Symington and Mr. Howard have, by their proposed plans, to cool nearly one hundred times as much, or about 1213 gallons per minute, supposing six gallons per horse-power per minute of injection water to be used. Now I presume that I need not tell you, that although the refrigeration of 13 gallons of water per minute can be perfectly and practically effected, it is quite another thing to have to deal in the same time with 1213 gallons per minute, although it is of a lower degree of temperature from which it has to be cooled than the 13 gallons above mentioned; and I have no hesitation in asserting, that the doing of that which Mr. Symington and Mr. Howard propose is totally impossible. We will, to illustrate the matter, take as an example the pipes as applied by the former gentleman to the outside of the *Londonderry* steam vessel, the quantity and size whereof were sufficient to hold as much injection water as would serve the engines for one minute only, reckoning six gallons per horse-power per minute;

wherefore it will be evident that the pipes will be emptied and filled once every minute. Now if the *whole* of the heat imparted to the injection water, by its admixture with the steam that works the engine, could be abstracted in one minute, then would Mr. Symington's plan effect the proposed object. But I assert, without fear of contradiction, that the whole of the heat (I mean in every degree) would not be withdrawn by the pipes in one, five, or even twenty minutes. If so, the injection water will become warmer and warmer every time it passes through the pipes; and supposing its temperature becomes elevated only two or three, or even one degree, per minute, it will soon become too hot to effect condensation, and in a very short time the engines will come to a state of rest. Now, Sir, I am not speaking in this way from theory, but from actual practice. I am the person who, in answer to some enquiries from the Lords Commissioners of the Admiralty, wrote the letter to Captain Gipps, of 6th May, 1835, respecting which Dr. Lardner was questioned by the Select Committee of the House of Commons on 7th July last. I have taken to a bleaching concern, which was formerly carried on by Mr. Hall; the engine respecting which I reported to the Admiralty is upon these bleaching premises, and it is ten horse power; it is the first to which Mr. Hall applied his patent condensers, but before he devised them, he most fully tried the application of pipes to cool injection water precisely in the same way as Mr. Symington applies them. In addition to the steam engine, I have a water-wheel which is worked by a stream of water that passes through a reservoir about 80 yards distant from the steam engine; in this reservoir Mr. Hall, in the year 1832, placed a number of pipes, of 7 inches diameter and 9 feet long each,* and there was a train of 4-inch and 3-inch pipes laid in the ground from the engine, to convey the injection water to the range of pipes in the reservoir; and there was another similar train of pipes to convey it back to the engine after it was cooled for reinjection. The water in these 7-inch, 4-inch, and 3-inch pipes was of course perfectly cold previous to starting the engine; at first it worked very well, but after being in operation a short time the mercury in the vacuum gauge became lower and lower, which was found to be owing to the injection water acquiring a small increase of temperature every time it was injected and passed through the pipes in the reservoir, till the engine, after working slower and slower for a certain length of time, stopped entirely. The engine was worked upon this principle for some time, but as it was found that no quantity of pipes at all within the bounds of practicability would answer the required purpose, they were taken away, and Mr. Hall devised his present condenser. I believe we had as much condensing surface in the pipes I have mentioned for the ten-horse engine in question as Mr. Symington put to each of the large engines of the *Londonderry* steamer, if not indeed even more. I have no hesitation in giving it as my opinion that the engines of that vessel never for one consecutive hour worked up to their full power upon Mr. Symington's plan, and without some injection water from the sea being admitted; and I challenge that gentleman to prove that I am wrong. Should your correspondents entertain the least doubt of the fact of Mr. Hall's having eight years ago fully done that which I have here stated, I will send you the vouchers of at least twenty other uninterested persons on the subject; and should they wish for any further information on the matter, I will with pleasure supply you with it.

I am, Sir,
Your most obedient Servant,
JOHN FOX.

Basford, near Nottingham, Sept. 21st, 1840.

* Previously to Mr. Hall's applying these pipes in the reservoir, he tried a *great number* of zigzag pipes placed in a vessel, through which a stream of cold water was passed, so as to come in contact with the outsides of the pipes, while the injection water to be cooled passed through their insides. The cooling surface of these pipes was very great, though not equal to that of the pipes placed in the reservoir.

THE "ECLIPSE" AND "FATHER THAMES."

Sir,—Your correspondents "T. D. S." and "Candidus" both concur in stating that the *Father Thames* has beaten the *Eclipse* "in a fair run to Gravesend;" but as neither of them has named the day on which the run took place, nor the time which it occupied, they must excuse me if I take the liberty to doubt their assertions. I have the less hesitation in doing this, as a friend of mine was on board the *Father Thames* last week when that boat was one hour and forty-eight minutes in steaming from Gravesend to Greenwich against the tide, the *Eclipse* having previously run the same distance in one hour and thirty-three minutes under precisely similar circumstances, as stated in my first communication. That the *Father Thames* is a fast boat, no person can dispute, but if she be as fast as the *Eclipse*, how happens it that the captain has orders *to stop* if the *Eclipse* comes alongside of him?

I gave it as my *impression* that the *Eclipse* was worked with steam at a pressure of 8 or 9 lbs. on the inch; but "from the *length* of the steel yard lever," "Candidus" would "put it down at considerably above 10lbs."

My mode of guessing may be, and no doubt is, "vague and unsatisfactory," as in fact I had acknowledged before "Candidus" made the *discovery;* but let me ask if it is more so than that which can determine the pressure of the steam "from the length of the steel yard lever," without any reference to the weight upon it, or to the area of the valve? Assuredly "Candidus" is a clever fellow!

I know no more of the pressure of the steam in *Father Thames* now, than I did when I last addressed you, and for the same reason; but *if* "it is under 5 lbs." it is contrary to the belief of all the river engineers whom I have conversed with on the subject, and they are not a few. But why cannot "Candidus" or "T. D. S." state the correct dimensions of the boat and engines at once, as I did those of the *Eclipse?* They assume *to know* them, and their refusal to communicate the knowledge they possess, or (as in their last letters) their palpable evasions can have but one effect—to produce a suspicion that there is *something to conceal.*

Since I last wrote, I *have* taken "another trip" in the *Father Thames,* and found the "*vibration*" almost as great as on my first excursion. Had it been as "slight" as "T. D. S." would have us believe, there could be no necessity for "placing two pieces of wood between" the levers used for lowering the funnel, and the funnel itself, seeing that they are at least two inches apart; but this is a "slight" admission which "T. D. S." may settle with the owners of the boat, who, I imagine, will scarcely thank him for it. In order to gratify "Candidus," I will favour him with another *impression,* which is founded on the observations of others as well as my own. It is, that the speed of the *Father Thames* is 14 miles per hour, and that of the *Eclipse* 15 miles per hour, in still water.

I am, Sir, your most obedient Servant,
A Subscriber.

P.S.—For what reason are *two* engineers required on board the *Father Thames?* It seems strange that a pair of "35"-horse engines cannot be worked with the same number of hands on that as on the other Gravesend boats.

Poplar, October 13th, 1840.

THE "ARCHIMEDES" AND "WILLIAM GUNSTON."

Sir,—If circumstances permitted, rest assured, after your remarks upon my letter to Captain Chappell, R.N., I would not trespass on your columns. The letter impugning my veracity, signed by the engineer of the Gunston tug-boat, renders that trespass necessary. In reply, my statement taken as it ought to have been in connection with the system of experiments acted on is correct. You are quite welcome to the full benefit of Mr. Blackburn's, who may not altogether be without ground for his, as there certainly was considerable manœuvring to get clear of vessels, and to get together in a position to *commence business;* and the *Archimedes* at that time might have pulled her consort in two or three cross directions, and possibly did, which that gentleman seems to have recollected better than

Your humble Servant,
Christopher Claxton.

Great Western Steam Ship Office,
35, Princes-street, Bristol, Oct. 20th, 1840.

GLEANINGS FROM THE PROCEEDINGS OF THE GLASGOW MEETING OF THE BRITISH ASSOCIATION.

(Continued from page 397.)

(Chiefly from the *Athenæum* Reports.)

Blue Sun seen at Bermuda.—Sir David Brewster read a letter from Dr. A. W. Harvey, describing a singular appearance of the sun at Bermuda, which made some white objects appear blue. Sir David observed, that in the course of a series of experiments on the colour of mixed plates, both as produced by the soft solids compressed between plates of glass, and as exhibited in laminæ of sulphate of lime, and other minerals containing strata of minute cavities filled with fluids, he was led to the opinion that the blue colour of the sun was produced in a similar way by vapour or water in a vesicular state, interposed between the sun and the observer. Owing to this cause, the sun may exhibit any colour, and, in point of fact, he had once seen the sun of a bright salmon colour, in which both red and yellow were mixed with the blue. A similar effect is often produced when the sun is seen in a cold winter morning through the windows of a carriage covered with hoar frost, or when it is seen through vapour similarly deposited. Sir David referred to observations of his own published in the *Phil. Trans.* for 1837, in which he had shown that the colours of mixed plates were phenomena of diffraction produced by the edges of transparent bodies separating media of different density.

Chemical Manufactures of Glasgow and its neighbourhood.—(Dr. Thos. Thomson.) The *smelting of iron* has been practised in the neighbourhood of Glasgow for more than fifty years. At present the quantity of iron smelted in Glasgow and the neighbourhood cannot be much less than 200,000 tons, which approaches to a fifth part of the whole iron smelted in Great Britain. Fortunately for the smelters, the iron-stone and coal beds

are associated together, the iron-stone either occurring in boulders or beds along with the coal. The rapid increase of iron smelting has been the consequence of the discovery by Mr. Neilson of the hot blast as in Scotland. Till of late years, no bar iron was made in Scotland, the smelters confining themselves to cast iron. It is now conducted on a great scale by Mr. Wilson, at Dundyvon, and by Mr. Dixon, at Glasgow, and perhaps by other iron-masters. There is an interesting manufacotry of steel, at Holytown, not far from Airdrie, where melting and casting steel may be seen. It is curious, that the clay in the neighbourhood answers perfectly for making crucibles for cast steel; but it does not answer so well as Stourbridge clay, for making glasshouse pots. On analyzing the two clays, it was found that the Garnkirk contained much more alumina and less silica, than the Stourbridge; showing that glass in fusion acts more powerfully on alumina than on silica. (2.) Another manufacture of importance, and which is indebted to Glasgow for the state of perfection which it has reached, is that of *sulphuric acid*. It was begun by Dr. Roebuck, at Prestonpans, about the year 1763, but about twenty years ago that manufactory was abandoned. The sulphuric acid works, at St. Rollox, on the banks of the Monkland canal, were begun about forty-five years ago. They were at first upon a very small scale, though now probably the largest of the kind in Europe. When in full work, the quantity of sulphuric acid made exceeds 300,000 lbs. avoirdupois per week. Forty-five years ago, it cost 8d. per pound; the present price is under a penny per pound. (3.) One of the great purposes to which sulphuric acid is applied at St. Rollox is, the manufacture of *bleaching powder, or chloride of lime*, as it is now called. When the mode of bleaching by chlorine was introduced into Great Britain, by Mr. Watt, in 1787, the very offensive smell and deleterious effects of that gas upon the workmen, was a formidable objection to its use. Various methods were tried to remove this objection. It was found, that if potash or soda was dissolved in the water before it was impregnated with the chlorine gas, the disagreeable smell was destroyed; but, unfortunately, this addition destroyed at the same time the bleaching power of the gas. At last Messrs. Knox, Tennent, and Macintosh discovered, that if lime were mixed with the water before it was mixed with the gas, the disagreeable smell was obviated, while the bleaching power still remained uninjured. They took out a patent for this discovery; but it was infringed upon by the Lancashire bleachers, a lawsuit was the consequence, and the patent was destroyed. It was then that Mr. Macintosh tried, whether chlorine would not be absorbed by slacked lime. The trial succeeded: a compound was formed, which readily dissolved in water, and the solution of which possessed great bleaching power; a patent was taken out for the manufacture of this dry powder, which the patentees distinguished by the name of bleaching powder. This patent was not infringed; the sale of it was at first small, and it was overlooked by the bleachers. The consequence was, that the patentees had leisure to perfect their method of preparing it, and to become able to sell it at so low a price, that it gradually superseded all the old methods of bleaching by chlorine. The process may be seen at St. Rollox in great perfection, and on a very large scale.—(4.) Another chemical manufacture, which may be seen, is *alum-making*. There are two establishments, one at the Hurlet, about six miles south-west, by the Paisley canal; another at Campsie, about eight miles off, near Kirkintulloch, on the Great Canal, and near the foot of the Campsie Hills. The alum is made from the *shale*, which exists in great abundance in the exhausted coal beds. This shale is a clay mixed with some coal, and with that variety of iron pyrites, which undergoes decomposition, and is converted into sulphate of iron, by exposure to the air. The sulphate of iron, thus formed, acts slowly on the clay, and in process of time converts it into sulphate of alumina. The alum-maker washes this altered shale, and obtains a solution of sulphate of iron and sulphate of alumina. When sufficiently concentrated and cooled, the liquor yields an abundant crop of *sulphate of iron*, which is removed, dried, and sold at a cheap rate. The sulphate of alumina does not crystalize till it is mixed with sulphate of potash or sulphate of ammonia; because alum is a double salt, composed of three atoms of sulphate of alumina and one atom of sulphate of potash, or sulphate of ammonia. Formerly nothing but chloride of potassum, brought from the soap-makers, was used. But of late years (at least at Hurlet), sulphate of ammonia, from the liquor obtained during the preparation of gas, has been employed. In general, the alum made at Hurlet contains both potash and ammonia; but the manufacturer can supply it free from potash. Such alum is convenient to chemists, because when it is heated to redness everything is driven off except pure alumina. At Hurlet and at Campsie both, the mode of concentrating the liquid by a current of heated air passing over its surface, deserves attention. (5.) At Campsie alum works may be seen another interesting chemical manufacture, the fabrication of *prussiate of potash*, a beautiful well known yellow salt, which crystallizes in truncated octahedrons. It was here that the manufacture of this salt, on a great scale, first

began. Before that time, it was only prepared in laboratories for scientific purposes, and sold at a high price. Mr. Mackintosh introduced it to the calico-printers, who use it extensively, to produce very beautiful blues and greens. It is prepared by burning the hoofs and horns of cattle in iron pots, along with a quantity of potash. The hoofs and horns of a hundred head of cattle are consumed every day in the works. (6.) Connected with this manufactory of prussiate of potash is another *of Prussian blue*. It is made by mixing sulphate of iron, alum, and prussiate of potash, and precipitating the whole by an alkali. The precipitate is at first light blue. But it is washed with new portions of water every day, for several weeks. At every washing the colour deepens, and when it has acquired the requisite shade, the Prussian blue is allowed to subside, the water is drawn off, and the powder allowed to dry. The colour varies according to the proportion of alum employed, and it has the finest colour of all, with the coppery lustre which is so much admired, when no alumina whatever is mixed in it. Another beautiful chemical product may be seen at Shawfield, near Rutherglen, about two miles from Glasgow, in the manufactory of Mr. White, named *bichromate of potash*, a salt very much used by calico-printers, and forming the finest and most indelible yellows, oranges, and greens. Its introduction constituted quite an era in calico-printing. This salt was originally made by heating chromiron ore with saltpetre, dissolving out the chromate of potash, and adding the requisite quantity of nitric acid to deprive the chromic acid of half its potash. When this process began, the salt was sold at a guinea an ounce. But now it may be had for two shillings a pound. It has been found that common potash of commerce may be substituted for saltpetre; and the manufacturers now contrive to form the bichromate at once, without requiring the use of an acid, which would nearly double the expense. Nearly all the bichromate used by the calico-printers is made here and in Liverpool. (7.) In the same manufactory may be seen a beautiful product, *tartaric acid*, which is used by the calico-printers to a large amount, chiefly to disengage the chlorous acid from bleaching powder, and enable it to destroy the colour on particular parts of the cloth, either that these parts may remain white, or that some other colour may be superadded. Tartaric acid is obtained from cream of tartar, by throwing down the tartaric acid by means of lime, and afterwards decomposing the tartrate of lime by means of sulphuric acid, and crystallizing the tartaric. (8.) At the same manufactory may be seen a pretty and simple process, by which the carbonate of soda is converted into the *sesquicarbonate*. By simply exposing it dry and in powder, in an atmosphere of carbonic acid gas, it absorbs the requisite quantity to be converted into sesquicarbonate. And this sesquicarbonate is chiefly used by the makers of soda water. (9.) Another chemical manufacture of considerable importance, and peculiar to Glasgow, is *iodine*. A few years ago there were no fewer than ten manufactories, in each of which it was made to a considerable extent; but as iodine is only used in medicine, the sale is necessarily limited, and most of these works are now abandoned. The process followed by all the makers was the contrivance of Mr. Macintosh. Iodine is made from kelp, and it deserves attention, that those kinds of kelp that contain most potash contain, at the same time, the most iodine. The kelp is lixiviated, and all the salts that can be extracted from the solution by evaporation are separated. The mother water remaining is now mixed with an excess of sulphuric acid. A great quantity of sulphuretted hydrogen is evolved, the bad effects of which on the workmen are obviated by setting it on fire, and allowing it to burn as it is extracted from the liquid. To the liquid thus freed from sulphuretted hydrogen and from muriatic acid, a quantity of binoxide of manganese, equal in weight to the sulphuric acid employed, is added. The whole is put into a leaden still, and heated to a temperature which must not exceed 190° or 200° at most. The iodine passes into the receiver, which consists of a series of spherical glasses, having two mouths opposite to each other, and inserted the one into the other. (10.) It may seem superfluous to mention *soap*, because it is a manufacture universally known; but soap of a very superior quality is made in Glasgow. The number of soap works amounts to seven, and one of these, that at St. Rollox, is the third, if not the second, in point of extent, in Great Britain. (11.) *Bleaching of cotton cloth* is carried on here to a great extent. It consists of four processes: 1st, The goods are boiled with lime, at a temperature above the boiling point of water. 2nd, The cloth is steeped in a solution of bleaching powder. 3rd, It is boiled with caustic soda or potash. 4th, It is steeped in water acidulated with sulphuric acid.

A New Method of Photogenic Drawing. (Dr. Schäfhaeutl.)—Dr. S. first obtains a paper of very great sensibility by a comparatively short process. He spreads on Penny's improved patent metallic paper a concentrated solution of the nitrate of silver (140 grains to 2½ drachms of fused nitrate to 6 fluid drachms of distilled water), by merely drawing the paper over the surface of the solution contained in a large dish. In order to convert this nitrate of silver into a chlo-

ride, Dr. S. exposes it to the vapours of boiling muriatic acid. A coating of chloride of silver, shining with a peculiar silky lustre, is by this method generated on the surface of the paper, without penetrating into its mass; and in order to give to this coating of chloride the highest degree of sensibility, it is dried, and then drawn over the surface of the solution of the nitrate of silver again. After having been dried, the paper is ready for use; and no repetition of this treatment is able to improve its sensitiveness. Dr. S.'s process for fixing definitively the drawing is as follows:—He steeps the drawing from five to ten minutes in alcohol, and, after removing all superfluous moisture by means of blotting-paper, and drying it slightly before the fire, the paper thus prepared is finally drawn through diluted muriatic acid, mixed with a few drops of an acid nitrate of quicksilver. The addition of the nitrate of mercury requires great caution, and its proper action must be tried first on paper slips, upon which have been produced different tints and shadows by exposure to light; because, if added in too great a quantity, the lightest shades disappear entirely. The paper, after having been drawn through the above-mentioned solution, is washed well in water, and then dried in a degree approaching to about 158° Fahrenheit, or, in fact, till the white places of the paper assume a very slight tinge of yellow. The appearance of this tint indicates that the drawing is fixed permanently. In order to obtain a photogenic drawing in a direct or positive way (without reverses), the author uses his above-mentioned paper, allows it to darken in a bright sunlight, and macerates it for at least half an hour in a liquid, which is prepared by mixing *one part* of the already described acid solution of nitrate of mercury with from nine to ten parts of alcohol. A bright lemon-yellow precipitate, of basic hyponitrate of the protoxide of quicksilver falls, and the clear liquor is preserved for use. The macerated paper is removed from the alcoholic solution, and quickly drawn over the surface of diluted hydrochloric acid (1 part strong acid to 7 or 10 of water), then quickly washed in water, and slightly and carefully dried in a heat not exceeding 212° of Fahr. The paper is in this state ready for being bleached by the rays of the sun; and in order to fix the obtained drawing, nothing more is required than to steep the paper a few minutes in alcohol, which dissolves the free bichloride of mercury. The maceration must not be continued too long, as in that case the paper begins to darken again. Another method of producing positive photogenic drawings is by using metallic plates, and covering them with a layer of hydruret of carbon, prepared by dissolving pitch in alcohol, and collecting the residuum on a filter. This, when well washed, is spread as equally as possible over a heated metallic plate of copper. The plate is then carbonized in a closed box of cast iron, and, after cooling, passed betwixt two polished steel rollers, resembling a common copper-plate printing-press. The plate, after this process, is dipped into the above-mentioned solution of the nitrate of silver, and instantly exposed to the action of the camera obscura. The silver is, by the action of the rays of the sun, reduced into a perfect metallic state, and the lights expressed by the different density of the milk-white deadened silver, the shadows by the black carbonized plate. In a few seconds, the picture is finished; and the plate is so sensitive, that the reduction of the silver begins even by the light of a candle. For fixing the image, nothing else is required, except dipping the plate in alcohol mixed with a small quantity of the hyposulphite of soda, or of pure ammonia.

Experimental Inquiry into the Strength of Iron, with respect to its Application as a Substitute for Wood in Ship-building. (Mr. Fairbairn.)—The number of vessels which of late years have been made entirely of iron, and the probability of the greatly extended use of this metal in ship-building, renders it desirable to attain additional knowledge as to its power to resist these strains to which it is subjected, in its application to the purposes above stated. Mr. Fairbairn's experiments have convinced him, that in proportion as the public become better acquainted with the valuable properties of this material, and its fitness for almost any purpose of naval architecture, they will be convinced that it is safer, and, perhaps, more durable than timber, and that confidence in it will be completely established. To meet the requirements for this purpose, the following series of experiments have been undertaken, and in a great measure completed. Part only, however, could at present be laid before the Section.—1st. A series of experiments on the strength of plates of iron, as regards a direct tensile strain, both in the direction of the fibre and across it. 2nd. On the strength of the joints in plates riveted together, and on the best modes of riveting. 3rd. On the strength of the various forms of ribs or frames used in ship-building, whether wholly composed of iron, or of iron and wood. 4th. On the resistance of plates to compression and concussion, and on the power necessary to burst them. The experiments were superintended by Mr. Hodgkinson, to whom Mr. Fairbairn acknowledged himself indebted for many of the results.

On Strength of Iron Plates.—In these experiments, all the plates were of uniform thickness. Their ends had plates riveted to

them on both sides, with holes bored through them perpendicular to the plate, in order that they might be connected by both, with shackles to tear them asunder in the middle, which was made narrower than the rest for that purpose. The results were as follows: Mean breaking weights in tons per square inch, when drawn in the direction of the fibre:—

	Tons.	
Yorkshire plates	25.77	Mean 22.52 tons.
Do. do.	22.76	
Derbyshire do.	21.68	
Shropshire do.	22.83	
Staffordshire do.	19.56	

Mean breaking weights in tons per square inch, when drawn across the fibre:—

Yorkshire plates	27.49	Mean 23.04 tons.
Do. do.	26.04	
Derbyshire do.	18.65	
Shropshire do.	22.00	
Staffordshire do.	21.01	

The foregoing experiments show that there is little difference in the strength of iron plates, whether drawn in the direction of the fibre, or across it. Mr. Fairbairn then gave the results of a long series of experiments on the strength of riveted plates. The same description of plates was here used, as in the previous experiments; the plates were, however, made wider than the former, in order that they might contain (after the rivet-holes were punched out) the same area of cross section as the previous ones. Mean breaking weights in pounds, from four plates of equal section, riveted by a single row of rivets:—

20127	Mean 18590 lb.
16107	
18982	
19147	

The mean breaking weights in pounds from four plates of equal sections to the last, but united with a double row of rivets:—

22699	Mean 22258 lb.
23371	
20059	
22902	

Whence the strength of single to double riveting is, as 18590 : 22258. But from a comparison of the results taken from the whole experiments, the strength derived from the double riveted joints was, to that of the single, as 25030 : 18591, or as 1000 to 742. Comparing the strength of plates alone with that of double and single riveted joints, Mr. Fairbairn gave their relative values as under:

For the strength of the plate 100
For that of double riveted joints .. 70
And for the single riveted joints .. 56

Hence, the strength of plates to that of the joints, as the respective numbers, 100, 70, and 56.

Mr. Fairbairn then gave a table containing the dimensions and distances of rivets for joining together different thicknesses of plates.

A discussion ensued as to the comparative strength and safety of iron boats. Mr. Fairbairn stated, that from the manner in which the sheathing is riveted, the whole vessel becomes one mass; and though he did not come forward as the advocate of iron against wood, he would state that he considered iron as one-third stronger than wood, weight for weight.—Mr. Grantham knew iron boats that had lasted twenty-eight years in fresh water.—Mr. Taylor built an iron boat for a canal in 1806, and it was now in good condition.—Mr. Mallet had found from his experiments on the action of sea water upon iron, that the duration of a half-inch plate in sea water would be about 100 years.

CITY FIRE-ESCAPES.

On Tuesday last the Police Committee of the Corporation sat at Guildhall, on which occasion the following Report upon the subject of fire-escapes was presented to the Committee from Mr. Daniel Whittle Harvey, the City Police Commissioner, and Mr. Braidwood, the Superintendent of the London Fire-brigade:—

"City Police Office, Oct. 13, 1840.

"Gentlemen,—In obedience to your resolution of the 22nd of September ult., 'That the City Police Commissioner and Mr. Braidwood be requested to consult together, and report their opinion as to the best plan for a fire-escape, and such as they would recommend for adoption in the City of London,' we have proceeded without delay to the consideration of this most important subject.

"Although we had the advantage of being present when the various models and plans were submitted to your Committee, and of hearing the interesting explanations of their proposed working, we considered it due to the ingenious contrivers, who came before you, to reconsider their respective plans and suggestions with minuter attention to details than was practicable at the first and rapid exhibition of them. The models and explanatory suggestions brought under the review of your Committee exceeded thirty in number, each of which embraced one or more of three distinct objects.

"1st. Machines intended for domestic use only, to be resorted to by inmates of houses in cases of fire.

"2nd. Machines to be externally applied, and made to combine the security of property with the protection of persons.

"3rd. Machines exclusively for the protection of life from fire, to be externally applied uner the responsible direction of the police.

"While we felt that our attention and inquiries ought to be mainly directed to the latter of these objects, we cannot withhold the suggestion that more than one of the

first-named plans might be introduced, at a trifling cost, into houses with great advantage, especially in neighbourhoods not immediately within the reach of more public appliances.

"When it is known that easy means of descent from the loftiest apartments of a house may be permanently obtained at a cost considerably under 60*s*., an obligation is imposed upon the heads of families, which to disregard would not only disarm complaint of its justice, but strengthen the impression that the public are too prone to rely upon external agency, and to throw aside the precautions of individual prudence.

"Having determined to confine our attention to the objects stated, we proceeded to the selection of those plans with a view to their minute inspection, which appeared to us to combine to the greatest extent the principal objects to be desiderated in a machine intended for the rescue of life from fire. These objects are simplicity and strength of structure, facility of working and of transfer from place to place, and the ready varying of elevation.

"Upon a review of the models submitted to your Committee in our presence, four of them in an especial manner attracted our attention, and it is due to the parties to state that they not only submitted their respective inventions without the slightest reserve to our individual examination, but to the keener criticism of each other.

"Each of the plans thus selected possesses exclusive merits; and, in the discharge of a duty so interesting to the public, we have not hesitated to embrace the great advantage which a combination of excellences, not exclusively the property of either, naturally affords, and which we consider will be found in the plan we shall presently venture to recommend for the adoption of the City of London.

"The great experience of one of us in cases of fires, and of others who have been attracted to them, justify the opinion, that unless the means of escape are at hand within a very few minutes after the discovery of a fire, all human efforts must prove unavailing; and, it is not less borne out by experience and observation, that when the means were promptly available, no person, with one melancholy and fatal exception, who has visibly sought aid, has failed to find saving help.

"We are the more anxious to impress upon the minds of the committee the paramount importance of instantaneous aid in cases of fire, because we feel that unless instantaneous recourse can be had to well-adapted machines, and experienced men to work them, all their efforts and wishes must fail. Equally supported by experience is the statement, that in the far greater number of instances, the fire-ladders now used by the London Brigade, have been found, when promptly at hand, fully adequate to the purposes of rendering assistance to persons in danger, and although other machines or contrivances may be brought to bear in wide streets and upon lofty houses, that in the narrow streets, courts, and alleys, which abound in the City of London, no other instrument can be effectually used.

"But at present the brigade ladder is only in partial use, under the direction of the Fire Brigade, and in co-operation with engines exclusively employed for the extinction of fire and the rescue of property.

"To render these ladders at all times available, they must be placed under the responsible superintendence of the police, at intervals not exceeding a quarter of a mile, and upon carriages which will hold the several parts or joints of the ladders compactly together, until they arrive at the spot required.(1)

"To carry the suggestion into effect of having a set of ladders at all times available within the prescribed space, we find that the number required for the City of London will not exceed twenty.

"But while the experience before reverted to leads us to the conclusion that with the appliances just described, no human life ought to be lost when the danger actually presents itself, we are not insensible to the intense feeling which pervades the public mind upon the subject brought under our consideration, and that it is the duty of all public authorities to make every reasonable effort at whatever cost, to assuage the fears of the public.

"With this impression strong in our minds, we feel that we should disappoint just expectation, as also the liberal and humane policy of the Corporation of London, were we to restrict our recommendation to the ladder already described. We therefore strongly recommend that a machine should always be at hand, whose firmer appearance, and rapid elongation, should afford assistance to the infirm, and dissipate the alarms of the timid. Each of the machines which have been finished and exhibited before us embrace some of the requisite qualifications, but not one combines the whole.

"The fire-escape of Mr. Davies(2) is by far the most simple, and the mode of descent superior to any other, where it can be applied, the metal basket in a great measure screening those in it from the smoke, or partial flames from the lower windows, but the entire machine is ponderous, and requires

(1) Described in *Mechanic's Magazine*, vol. xxvi. page 449; and vol. xxviii. page 71, Nos. 709, and 743.

(2) Described in *Mechanics' Magazine*, vol. xxxiii. page 113, No. 884.

greater aid to move it with celerity than can always be obtained at the instant, while its unchangeable length restricts its action to all but the widest streets.

"The machine of Mr. Wivell (3), which has been for some time before the public, is superior to that of Mr. Davies, in so far as it is capable of some reduction, as well as extension, and moves on a carriage of easier guidance, yet its fixed length of 35 feet, and the great strain it requires to elevate it, together with the impediment occasioned to its progress by an adverse wind acting upon the canvass, and its inapplicability to the narrow streets, which abound in the City, are decided difficulties to its adoption.

"The sliding ladders of Mr. Gregory (4), when placed upon the carriage of Mr. Wivell, form the machine which, upon the whole, we venture to recommend for adoption in the City of London. The utmost length of these ladders, when travelling, is 24 feet; at which height they may be instantly raised, and without being moved, can be quickly extended to 40 feet, and with a little contrivance may be carried considerably higher.

"This machine may be drawn along the streets quickly, and quickly elevated by two men, while the method of raising the additional length is simple, and unencumbered with cordage and other contrivances which complicate many of the fire-escapes submitted to our inspection.

"While we feel assured that in carrying out a plan which has for its object the first of social duties, the Corporation will not be startled by expense, yet it may be expected that we should submit to your Committee some estimate of the probable annual cost of maintaining the proposed establishment, as well as the preliminary outfit.

"To have a set of brigade ladders, on a fitting carriage, in which are to be stored the ropes, belts, canvass bag, and other conveniences to facilitate descent, at intervals sufficiently near to be in actual use within five minutes after the discovery of a fire, would require twenty complete sets, and would cause an outlay of from 300*l.* to 400*l.*

"We further propose that ten of Gregory's ladders, mounted as before described, and similarly equipped as the other ladders, be assigned to appropriate localities, and committed during the hours of the night to the charge of the police constables.

"The cost of these ladders, with the carriage and equipments, would be between 300*l.* and 400*l.*, to which must be added the constant charge of ten constables.

"That these machines may be used with promptitude and precision, we suggest that the officers and constables of the police force should be frequently exercised in their use, and the whole placed under the control of the chief office.

"In noticing the subject of cost, and the maintenance of the Life Preserving Establishment we are induced to recommend, it will not fail to occur to your Committee, that its adoption will save the parochial authorities, within the City, much expense, and relieve them of the gravest responsibility.

"We have the honour to be, Gentlemen,

"Yours, &c.

"D. W. HARVEY,

"JAMES BRAIDWOOD."

(3) Described in *Mechanics' Magazine*, vol. xxvii. page 162, No. 723.

(4) Described in *Mechanics' Magazine*, vol. xi. pag 113, No. 295.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

RICHARD BEARD, OF EGREMONT PLACE, NEW ROAD, GENTLEMAN, *for improvements in printing calicoes and other fabrics*, being a communication from a foreigner residing abroad.—Enrolment Office, Oct. 6th, 1840.

There is a multiplicity and complexity of parts involved in these improvements which makes it difficult to explain their minute details; their general character, however, may be gathered from the following epitome of a threefold claim.

1. A mode of constructing a printing cylinder with all the raised or printing surfaces moveable, so that all those parts that are to receive the same colour may be brought together for that purpose, and afterwards dispersed over the cylinder in their proper places to form the pattern.

The mode of accomplishing this object is by means of sliding bars, and other adjuncts, in connection with a guider or inclined plane, so placed as to allow the raised surfaces that are to be charged with one colour to range themselves round the cylinder, in such a position as to take up the colour from the endless felts or other suitable materials, and then, by the action of the guider, to resume their original positions around the printing cylinder.

2. A mode of constructing a printing cylinder, so that the printing parts may be made to approach to or recede from the centre of the cylinder.

In this case the pattern is formed upon the ends of sliding bars, each one being moveable and independent of its neighbour. They are confined to their respective places, but slide freely inwards and outwards by means of bosses attached to the cylinder. There are slits or openings in each of these bosses, which become guides to the bars, so that, when properly adjusted, on turning the cylinder, each bar will project as it arrives opposite its proper colour. After passing its

colour, an eccentric motion, placed near the centre of the cylinder, causes the changed bars to move inwards, and other bars to protrude.

3. A mode of producing surfaces of cast metal on printing cylinders.

The pattern required is punched out of a sheet of zinc, $\frac{1}{16}$th of an inch in thickness, which is placed in a suitable mould, and melted metal poured into it, so as to fill up the vacancies produced by the punches. The face is then polished off, and treated with an acid which attacks the zinc, while it leaves the pattern in the other metal standing, forming a surface suitable for printing purposes.

JAMES CALDWELL, MILL-PLACE, COMMERCIAL ROAD, ENGINEER, *for improvements in Cranes, Windlasses, and Capstans.*—Enrolment Office, October 15th, 1840.

The first improvement relates to cranes, whereby the weights raised and lowered are more advantageously distributed. From an upright central post, mounted in a suitable step, the jib branches off in the usual manner; on the opposite side, a platform carries an upright and a diagonal stay from the post, connected above by an inclined stay from the jib; this arrangement gives increased stability, from enabling the strain of weights raised and lowered to be carried behind the centre, and thus allowing the crane to be worked more easily and advantageously. The chain is not wound upon the barrel, but only passed two or three times round it, the slack being taken up by a falling weight at the end opposite the jib of the crane. The second improvement is a mode of causing a rope or chain to fleet or clear itself on the barrels of cranes, &c., as hereafter described. The third is an improved construction of crane for loading and unloading lighters, barges, and such like craft; this improvement is only applicable where goods, &c., are raised in boxes of an uniform size—the loading or unloading of coals, for instance. The boxes are placed in two or more rows of threes, before and behind the crane, which consists of a revolving jib, and a counterbalance connected together by a strong tie at their extreme ends, and also tied diagonally to the centre post. The jib is composed of two iron plates with projecting ridges on their inner surfaces, upon which a runner moves up or down by means of friction wheels; this runner carries a pulley, which the lifting chain runs upon. At three different points in the jib there are stops, corresponding with the situation of the three boxes before mentioned, so that the runner, with its pulley, may be placed over each one in succession, the runner being under the control of a brake. The chain being made fast to one of the boxes, passes over the runner pulley to another pulley on the end of the jib, then takes a few turns round the barrel, and passes on to the counter-weight. There are two ratchet wheels in opposite directions, to prevent the barrel from running back, one only being used at a time. The fourth improvement is in the apparatus for working windlasses; in the first place the three palls are coupled together so that by means of a lever they may be simultaneously raised, the motion of the windlass being controlled by a brake. Cranked levers move on strong axes in the post, in which handspikes are inserted; to these cranked levers are attached, by a pin joint, an instrument consisting of two iron plates bolted together, the further bolt being so formed as to take hold of a series of teeth placed round the barrel of the windlass. When these levers are raised they slide back over the teeth, but on depressing them they pull the windlass round. There is also a contrivance for disconnecting this "driving instrument," and attaching the brakes to the same levers. If the brakes do not present a sufficient resistance in bad weather, "weather pins or bits" are placed below the deck bearers, round which the rope is passed. Another mode of constructing windlasses with double barrels is also described, with a clutch for working them together, or separately; as also a mode of placing the palls below the barrel, in which case each one is furnished with a projection, so that on depressing a lever the whole are raised together. In the former case the windlass gradually contracts towards the centre, but in both instances is furnished with "fleeting plates" (the fifth improvement), consisting of inclined plates of metal placed at such angles as to cause the rope or cable to slip off towards the centre, and always to keep itself clear and avoid fleeting. In large windlasses, friction pullies may be employed, but in ordinary cases the plane metal surfaces will be found sufficient.

The sixth improvement consists in the application under various modifications of similar apparatus to capstans to prevent "surging." The claims made are—1. The mode of constructing cranes, as described. 2. The mode of fleeting or clearing of the rope or chain on the barrels of cranes, by applying inclined surfaces. 3. The mode of constructing cranes for loading and unloading barges, and such like craft. 4. The application of the lever and instrument for working windlasses. 5. The mode of applying inclined surfaces, which are called fleeting plates, to the barrels of windlasses. 6. The mode of applying the same to capstans.

SAMUEL WILKES, DARLESTON, IRONFOUNDER, *for improvements in the manufacture of vices.*—Enrolment Office, October 16th, 1840.

These improvements relate, in the first place, to the making the chaps or bodies and limbs of vices of malleable cast iron, subsequently submitted to an annealing process. The patterns being prepared in some suitable material (brass being preferred) are to be carefully moulded in sand, in the usual manner: the holes necessary for subsequently putting the parts together being produced by sand cores. Also a mode of casting the pins or male screws of vices hollow; the hollow should be about ⅛th of an inch in diameter, and may be left open, or it may have a wrought iron plug driven into it, to strengthen it. The annealing is to be performed with the rich iron ores of Cumberland, the time being regulated by the size of the article; articles of half an inch in thickness requiring about four days. The articles should be placed vertically, and heated to a blood red for three-fourths of the time, afterwards to a full red or white heat. Secondly, a mode of steeling the chaps of vices. Two dove-tailed grooves are formed horizontally in the jaws, into which slide tempered steel plates, properly cut. This method is considered by the patentee as greatly superior to the present mode of welding the steel faces, and with some justice; when thus fitted up, the steel faces can at any time be exchanged, recut, &c., without taking down the vice. Thirdly, the construction of parallel vices. The fixed chap is furnished with a plate having two dove-tailed projections, which the moveable chap embraces; there are also side guides, which give great stability to the whole. A mode of constructing parallel bench vices is also shown. The moveable chap is hollow, the under surface being flat, and moving along a bar, formed with the fixed chap, and which, with the leg, is the means of fixing the vice to a bench. A male screw works through the fixed chap; a tube, having a slit on the under side from end to end, is fixed to two hollow projections of the bar by two screws; a nut, having a female screw formed therein, is cylindrical, and moves within the tube: the nut is affixed to the moveable chap. By thus using cylindrical surfaces for the parts to move on, greater facility is obtained in making the parts accurate, and superior action is the result.

The claims are: 1. The mode of making the chaps and bodies or limbs of vices, by casting them of malleable iron, and submitting them to the process of annealing; and also the casting of the pins or male screws of vices hollow.

2. The mode of applying steel faces or surfaces to the chaps of vices.

3. The mode of constructing the sliding chaps of vices by applying double guides; and also the mode of constructing vices by cylindrical tubes or surfaces for sliding chaps.

HEMMING'S IMPROVED GAS-METER.

In the ordinary gas-meter originally invented by Mr. Clegg, there are certain defects which have hitherto prevented its successful operation. These are, a variation in the quantity of water the meter ought to contain, the freezing of the water in severe weather, and the corrosion or destruction of the metals from the voltaic or chemical action that ensues, when different metals are exposed to a liquid containing alkaline or other impurities. If the meter do not contain the exact quantity of water necessary, it no longer measures the gas passing through it correctly, and either the consumer or the supplier is defrauded; if the water freeze, the gas will not pass to the burner until the troublesome process of thawing the liquid is adopted; and if the metals are corroded, the drum of the meter may probably refuse to revolve on its axis, or it may be rendered entirely useless.

Mr. Hemming has overcome all these defects, in a very simple but perfect manner. His patent meter is provided with a small cistern, containing water to supply any loss in the meter by evaporation, or from other causes. By an apparatus of beautiful simplicity, unencumbered with valves or cocks, the water from the cistern immediately enters the meter, if there be the smallest quantity less than there ought to be, and ceases to flow the instant the true water-line is attained, while to guard against any excess of liquid, a contrivance is employed, by which the slightest additional quantity is immediately discharged into a separate receptacle. The metals are protected from chemical or voltaic action, by pieces of zinc, which are soldered on to different parts of the meter. By well known chemical laws the zinc attracts to itself all those impurities which dissolve or corrode other metals less oxidable than itself. This protection of the vital parts of the meter by zinc, enables the patentee to employ, in lieu of water, a saline solution, which does not freeze until cooled below the lowest temperature it is subject to in Great Britain.

The improved meter has been put to the most severe tests by highly skilful engineers connected with several large gas establishments, and its asserted advantages have been all amply borne out. We are happy to learn that the proprietor of Mr. Hemming's Patent has had an immense demand for them already, and that there is a probability of the public being now supplied with a meter which will cause them no trouble in winter, which will secure them from overcharge, and by its durability will spare them the expense and annoyance of frequently repairing or renewing this useful and beautiful contrivance.—*Morning Advertiser.*

TEST FOR WHITENESS.

Sir,—Can any of your numerous correspondents inform me of the best test for *white?* It is commonly known that snow is—as all *whites* in comparison with it partake more or less of a blue or yellow tint—but snow cannot always be obtained.

I am, Sir, your obedient Servant and Reader,
V.

October 16th, 1840.

NOTES AND NOTICES.

Pushing on Railways.—The dangerous consequences of this practice, so ably commented upon in our last number, by our old correspondent Col. Maceroni, were strikingly exemplified a few days since. The *Paisley Advertiser* states that at four o'clock last Saturday morning, as an engine was coming westward on the joint railway, and pushing seven empty ballast waggons before it, at the moment when the first waggon was about to clear the west-end of the tunnel, it was suddenly forced off the rails, and all the other six waggons, with the tender, were thrown over and crushed together in a heap. Of 27 men that were in the waggons, 12 or 14 were hurt, 9 of them seriously. The engine itself was not thrown off the line. How many victims are to be sacrificed, before this highly reprehensible practice is strictly forbidden? How can any mechanical mind tolerate an absurdity so unmechanical, even leaving its imminent danger out of the question?

Escape from Fire.—On Tuesday night, about 11 o'clock, a fire broke out in the house of Mr. Kingsnorth, at Stone's End, in the Borough. The fire originated at the back of the premises, and before discovered, the ascending flames and smoke reached the stair-case, and out off the egress of the inmates in that direction. Mr. and Mrs. Kingsnorth, on being alarmed, rushed to the first floor windows, when the police directed them to throw out a blanket; this being complied with, the police held the blanket for Mr. and Mrs. Kingsnorth to jump into, which they did in safety. The shopman appeared at the second floor window, from which he most unhesitatingly threw himself, and was also caught uninjured. The servant maid was still higher up, and soon appeared on the third floor; however, she fearlessly followed the example of her fellow servant. The great height from which she descended, caused the fabric of the blanket to give way, but it had so effectually broken her fall, that she got up and walked away unhurt. Mr. Baddeley was on the spot within five minutes after the discovery of the fire, with a set of Merryweather's fire-escape ladders, in good time to have rescued all the inmates, had they not already precipitated themselves in the manner stated. The ladders were promptly raised, and Mr. Baddeley having ascended and found that no person remained on the premises, proceeded to rescue some portion of their contents. Mr. Baddeley was followed in about five minutes by the fire-brigade from the Southwark-bridge Road, with their engines, and water being obtained, the fire was promptly extinguished. D.

Indian Isinglass.—A product of India, the suleah fish, which abounds in the rivers that intersect the Sunderbunds, as also in the estuaries of Bengal, has attracted the attention of a correspondent, who shows that it possesses a property from which isinglass is manufactured under a monopoly raised by the Chinese, and which has hitherto escaped the observation of European speculators. According to the description afforded, the suleah attains a large size, weighing in some cases 1 cwt. and upwards. It may be taken all the year round, and large quantities of it are brought up in boats to Calcutta, where it is cured, and thence conveyed as an article of merchandise into the inland provinces, where it is purchased for consumption, chiefly by the poorer classes. The discovery that this fish contained the property for the manufacture of isinglass was made in the following manner:—A purchaser gave his servant two that he had bought of a fisherman, and desired him to do the best he could with them. A subsequent examination of the bladders was accidentally made. They were found to resemble dull amber, and were exceedingly hard and pellucid, bearing a striking resemblance to the book isinglass of commerce. He had a portion of one of them cut off and boiled in some clear tank water, strained off and placed in a cool atmosphere, and on the following morning it turned out as firm and translucid an isinglass cake as he had ever witnessed. Satisfied that his discovery was a valuable one, he submitted the further working of it to an eminent chymist at Calcutta, who having cleansed it, by the help of a Chinese shoemaker cut it into fine threads, and then it appeared equal in every respect to the isinglass in the market. On further inquiry it was ascertained that the Chinese had a monopoly arising out of the suleah fishery; that, in fact, not one fish out of a thousand that came into the market ever contained its bladder, but that they were taken out by the fishermen as soon as the fish were caught, and handed over to the Chinese contractors. These bladders were shipped off to Macao, where they were dressed and prepared for the Chinese trade. It is supposed that to the Chinese this must be a considerable source of profit.—*Times.*

Improved Capstan.—A new schooner, called the *Breeze*, built by Messrs. Hedderwick and Rankin, in Glasgow, having come into our harbour to load sugar for the Mediterranean, has excited considerable interest by having a capstan on an entirely new principle. The common capstan is worked by bars radiating from the centre, about six feet long, and requires about 12 feet of clear circular space on deck to work it. This prevents its application in many cases where a clear space of this diameter cannot be got without sacrificing the room or accommodations of the vessel. It is to obviate this disadvantage, and at the same time to produce a more powerful machine, that the new capstan has been invented. Several shipmasters, and others connected with the shipping of this port, inspected it yesterday, and the general impression is, that it is a decided improvement, and possesses many advantages over the common ship capstan. It is the invention of Mr. Peter Hedderwick, who had the drawings and a model of it made some time back, although the one on board of the *Breeze* is the first that has been made on the large scale, merely by way of trying its power. Its advantages over the common capstan are—1st, that it occupies less room on deck; 2d, that it can be fitted up in places where it would be impossible to work the common capstan; 3d, that it is much more powerful, and does not fatigue the men as the running round with the common capstan does; 4th, that its power can be increased without requiring any more room on deck; 5th, that it can be converted into a ship's winch in half a minute; 6th, it can be shifted from one part of the vessel to another. On board the *Breeze*, it stands between the main hatch and main mast, (where, in this case, it would be impossible to work a common capstan) but as it is complete in itself, requiring no other fitting on standard to support it but merely the spindle, it can be shipped or unshipped at pleasure; and, any large vessel having one, it might be shipped on the main deck within three or four feet from the front of the poop, or shifted upon the deck, or top-gallant forecastle, as might be required.—*Greenock Advertiser.*

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Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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CROSSE AND BLACKWELL'S PATENT SOHO LAMP.

Fig. 1.

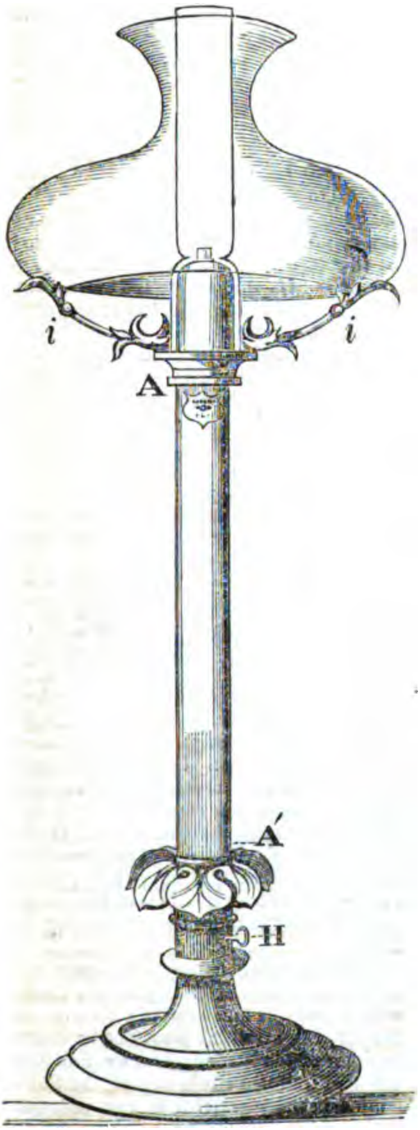
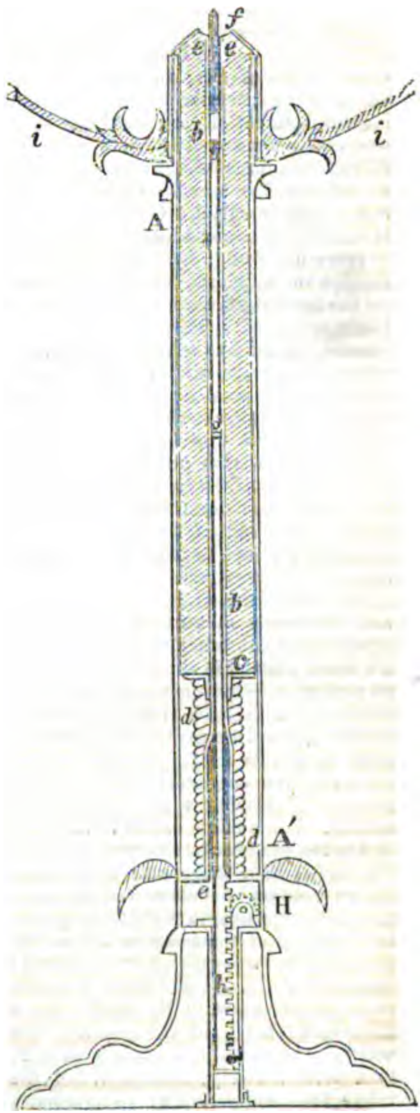


Fig. 2.



CROSSE AND BLACKWELL'S PATENT SOHO LAMP.

The expense of artificial light forms such an important item in the expenditure of every family, that it becomes in all cases one in which it is desirable to exercise the utmost possible economy, so as to obtain the greatest quantity of light, at the smallest possible cost. An active rivalry is now going on between different modes of illumination, chiefly in the adaptation of lamps to burn the cheaper class of oils; and this, notwithstanding the extensive and daily increasing employment of gas; what our position at this time would have been, if this invaluable source of light had remained undiscovered is a curious question, and one not easily solved. Certain it is, that even now, the demand for oil and candles of every description keeps pace with the supply, and supports prices which compel the most rigid economy in the use of these materials. These remarks have been suggested by the soft, yet full light which at this moment "cheers our mid-day gloom," emanating from one of Crosse and Blackwell's Patent Soho lamps; and as this lamp has several peculiarities, as also peculiar merits, we are desirous of introducing it to the acquaintance of our numerous readers, and with the aid of the accompanying drawings we hope to make its construction easily understood.

The Soho lamp is constructed on the novel principle of burning solid tallow, or any other substance of which candles are usually made, in the same manner as oil; that is — by the wick remaining stationary while the consuming substance is raised up to it. The arrangement by which this is accomplished is shown by the engravings on our front page. Fig. 1 being a perspective view, and fig. 2, a section of the Soho lamp. A A is the ornamental external casing of the lamp; *b b*, the candle, which is a hollow column of tallow, resting upon the pusher *c*, and always abutting against the cone-top of the lamp or burner, by the constant pressure of a spiral wire spring *d d*. A fixed tube *e e* passes through the centre of the candle, down the whole length of the pillar. The wick *f* is attached by a hook joint at *b'*, to a vertical rod *g*, sliding within the tube *e*, the lower part of which terminates in a rack *h*, acted upon by the pinion and nut H; so that on turning the nut the wick can be raised or lowered at pleasure. The cone-top which confines the candle, is held on by a bayonet joint in the usual manner; *i i*, is the gallery for the glasses.

When it is required to introduce a wick, the nut H is to be turned till the hook on the top of the rod *g* protrudes from the tube *e*; the short cotton wick being prepared by dipping in wax, and provided with a loop, is attached to the hook, and the pinion reversed until the rod is withdrawn sufficiently low to take the wick into the central tube, about ¾ of an inch being left projecting for lighting. On the wick being lighted, as the tallow melts, the spring *d d* will force up the column of tallow to supply the place of that consumed, till the whole is expended. If the light is not strong enough, by turning the nut H the wick is raised, and the light proportionally increased; if too strong, the reverse motion depresses the wick and diminishes the light. In this way the rate of combustion, and quantity of light obtained, is always as much under command as in the best oil lamps.

To extinguish the lamp, turn the nut H till the wick is drawn completely into the tube, and raise it again immediately while the tallow is warm.

The advantages of this lamp are, that it requires no snuffing or attention after it is once lighted; that the degree of light may be increased or diminished at pleasure; that when once regulated, it will always remain at the prescribed height; and its simplicity, its mode of action being understood on the most cursory inspection. It is cleaned and trimmed with as much facility as preparing a common candlestick for the table, and cannot be put out of repair but by actual violence. The manufacturers state that this lamp will give a light equal to four mould candles, at an expense of little more than a farthing an hour.

Our visual organs being in some degree of a delicate character, we are somewhat fastidious and hard to please in the matter of light, which must not be either too dim or too strong; and we find the soft and uniform effulgence of the Soho lamp especially grateful to our editorial optics.

CITY FIRE-ESCAPES.

Sir,—The report of Messrs. Braidwood and Harvey, inserted in your last Number, page 427, on the kind of fire-escapes best adapted for the protection of the citizens of London, has, I doubt not, been read with considerable interest, and I only regret that it is not such as to be altogether satisfactory.

It is now five months since your talented correspondent, Mr. Baddeley, called the attention of the city authorities to the defectiveness of their police force in cases of fire, especially with regard to the preservation of life; but it is probable, that gentleman's humane exertions to alleviate the fatal consequences of these deficiencies would have been unavailing, had not many serious, and two fatal fires, followed so closely upon each other, that it became impossible any longer to turn a deaf ear to the loud and pressing complaints which arose on all sides.

The subject was warmly taken up by Mr. Lott in the Court of Common Council, where, however, he had to contend not only with the apathy and lukewarmness of many, but with the scarcely concealed hostility of some of his colleagues.* At first it was proposed to transfer the investigation of this *delicate* and *difficult* question (!) to the notable wiseacres in the Adelphi; it was, however, ultimately handed over to the Police Committee, who, after holding several meetings, and going through the form of seeing the plans and hearing the explanations of upwards of thirty ingenious men, found the subject too deep for the deliberations of their collective wisdom, and turned it over to their Police Commissioner and Mr. Braidwood. After very great deliberation, on a subject which, from *practical men*, really required very little, these gentlemen have made their report to the Police Committee, who will in due course report thereon to the Court of Common Council, whence it will probably be referred back to the Police Committee, and by them to their Commissioner for adoption; so that from the time required for the business to progress through these several stages, it is probable another family or two may yet be burned to death before any provision to the contrary is completed.

* See page 118, No. 884.

With reference to the report, I have already intimated that it is not altogether free from objection; and I would crave permission to make a few brief observations on some points which seem to require elucidation.

After the great delay that has already occurred, it seems these gentlemen are still unable to do better than to adopt the plan originally suggested by Mr. Baddeley—viz., the portable fire ladders, which are stated in the report to be "fully adequate to the purposes of rendering assistance to persons in danger," and that "in the narrow streets, courts, and alleys, which abound in the city of London, *no other instrument can be effectually used!*" Twenty sets of these ladders, therefore, are recommended to be provided, which, so far as it goes, is all very well; but what will be thought of these practical men, when immediately afterwards we find them pandering to the vulgar prejudices of the ignorant, and admitting a necessity for adopting some large and showy apparatus, "whose *firmer appearance* should assuage the *fears* of the public, and dissipate the *alarms* of the timid!" Now as the provisions are to be made for cases of life or death, every measure proposed should be strictly *utilitarian;* the portable ladders either *are*, as stated in this very report, "fully adequate to the purpose," or they *are not*. If they are so, no other apparatus is required; if not, let one that is be adopted in preference. All that is wanted is, some sure and certain means of enabling the police to save life in all cases of fire, in all situations, and under all circumstances, where human efforts can prevail, without being misguided by the imaginary "fears of the public," or the groundless "alarms of the timid." Away with such mawkish sentimentality.

It is stated in the report, that "at present the *brigade ladder* is only in partial use, under the direction of the fire brigade, and in co-operation with engines exclusively employed for the extinction of fire and the rescue of property." Now this statement is notoriously false. If it is only meant to refer to the bare ladder, unequipped with the appendages, introduced (I believe*) by Mr. Baddeley, still it is untrue: seve-

* See Penny Cyclopædia, Art. Fire-escape.

ral sets of the *brigade ladders* being in use in St. Andrews,* and some other parishes both in and out of London; while the fire-escape ladders, in their highly complete and efficient state, as hitherto manufactured by Mr. Merryweather *only*, are extensively employed throughout the Metropolis,† as well as in many provincial towns, and on both Continents.

By the bye, I notice a somewhat remarkable suppression of the names of Mr. Baddeley and of Mr. Merryweather throughout the report in reference to these ladders; they are only spoken of as the "brigade ladders." Now the fact is, the brigade ladder was not exhibited to the Police Committee, and therefore was not one of the "four" plans which, "in an especial manner, attracted attention." Merryweather's ladders were exhibited, and their difference from the brigade ladders pointed out to the Committee by Mr. Baddeley (see page 320 of your 893rd Number); and that *this* is the contrivance meant, seems evident from the allusion subsequently made to "the rope, belt, and carriage," which have ever been the distinguishing peculiarities of Merryweather's ladders. If the total suppression of Mr. Merryweather's name (while those of other parties are given) is accidental, it is a great piece of carelessness; if intentional, then it is a gross injustice towards a highly respectable tradesman, and a very worthy man.

The report recommends the providing of 20 sets of the portable ladders, and 10 of those of "*firmer appearance.*" From the data given, it will be seen that for the same sum, 40 sets of the former might be obtained, which would infinitely increase the actual protection afforded; though I deem 40 sets inadequate, to give satisfactory assurance of prompt and effectual assistance in all cases. I entirely deny the policy of adopting any "partially applicable" machines, if such as are *universally applicable* can be obtained; the inapplicable one may be brought first, and the time required to correct the mistake may be attended with fatal consequences.

The pecuniary part of the report is of a very slovenly and somewhat Irish character: after observing that "it may be *expected* that we should submit some estimate of the probable *annual cost* of maintaining the proposed establishment, as well as the *preliminary outfit*, what is submitted? The cost of the *preliminary outfit* within about 33 per cent.—rather a wide guess, considering that all the materials were at hand (or might have been readily obtained) for making an accurate calculation! The probable *annual cost* is omitted altogether; may we expect a postscript?

In conclusion, I am compelled to state that the present report is not so satisfactory as the names affixed to it would lead us to expect; it savours strongly of the old leaven of corporation jobbing, and bears evident marks upon its face of being intended to serve something more than the mere cause of neglected

HUMANITY.

Lombard-street, October 26th, 1840.

* With a set of which, *five lives* were very recently saved by the police.

† Two sets are stationed within two minutes' walk of where I am now writing.

MESSRS. BRAIDWOOD AND HARVEY'S REPORT ON CITY FIRE-ESCAPES.

"*Palmam qui meruit ferat.*"

Sir,—The report of Messrs. Harvey and Braidwood, on city fire-escapes, being now before the public, I take the liberty of making a few remarks thereon; and I flatter myself I may be pardoned —my acquaintance with these matters, both in theory and practice, being at least equal to that of any person.

With all due deference, therefore, to the opinions of these gentlemen, and with every respect for their abilities and good intentions, I trust I may be excused for differing from the conclusions to which they have arrived.

The total number of fire-escapes recommended by them is *thirty*,—ten of them being only partially available. The result of my investigations on this subject, induces a conviction, that less than SIXTY fire-escapes will not be sufficient to ensure the complete protection of the citizens, and even these must be universally applicable.

The *portable ladders* are, after all, to form the staple apparatus; but I consider the adoption of *carriages* for them highly injudicious; it is true, that in my communications in May last to the Po-

lice Commissioner, and to the Lord Mayor, I recommended the employment of carriages, and exhibited the ladders at Guildhall so mounted; but it should be borne in mind that this was for the purpose of combining *fire-extinguishing machinery* with the ladders, which is not now to be adopted. In one of the recommendations of the report "ropes, belt, and canvass bag," are to be "stored *in* the carriage;" which implies, I presume, that they are to be detached from the ladders, which will be an alteration—but assuredly no improvement. No one knows better than Mr. Braidwood, the confusion and annoyance sometimes occasioned by loose cordage, even in tolerably expert hands, and I cannot help thinking some error has crept into this part of the report.

In the popular contrivance of Mr. Merryweather, "the rope and belt," is conveniently affixed to the ladders—always at hand when required, but no incumbrance if not wanted to be used; it is instantaneously disengaged if needed, and I must be permitted to doubt the possibility of altering for the better, this very efficient and satisfactory arrangement.

The rope and belt being thus provided, the "canvass bag" is altogether superfluous; no "other contrivance to facilitate descent" being necessary. With this simple apparatus alone, I have brought down persons of all ages,

"From youth to hoary age,"

with perfect ease and safety.

The carriages for the ladders would, if adopted, cost nearly or quite as much as the ladders themselves, while it would be exceedingly difficult, if not wholly impossible to find suitable depositories for them at the places to which a regular distribution would assign them. By dispensing with carriages, and hanging a set of the ladders around the walls of each police station, depositing the intermediate ones in snug boxes, as is already done in the city, in St. Andrew's, St. Pancras, and elsewhere—great advantages would result.

An establishment of this kind, on the extensive scale I have ventured to suggest, would not exceed the *minimum* expense quoted in the report; the preliminary outfit, and annual cost of maintenance would be as follows:—

Sixty sets of Merryweather's portable fire-escape ladders, with guide wheels, safety belt, rope, and disengaging apparatus, complete, with (say) 40 boxes...... £600

The annual cost of maintaining these in a perfect and efficient state, would not exceed........ £20

With this outlay, it must be tolerably apparent that considerably more than three times the amount of protection would be ensured, than could possibly be afforded by the provisions advised in the report. No expense would be incurred for rent, nor would any extra constables be required to attend solely to the escapes, while the mode of using the foregoing, being simple, would soon be learned by the whole force. The escapes would also always "be at hand within a few minutes after the discovery of a fire;" being nearly one for every other beat throughout the city; their proximity would also be another very sufficient reason for abandoning the use of carriages.

I remain, Sir, yours respectfully,

WM. BADDELEY.

London, October 27, 1840.

LONG AND SHORT STROKE STEAM ENGINES, ANTHRACITE COAL, &c.

Sir,—In No. 890 of your Magazine is a communication from "P. R. H., of New York," on the comparative merits of long and short stroke steam engines, the intention of which is to show that long stroke engines possess considerable advantages over the short stroke ones so much used in this country; and certainly his statement of work done on board the *North America*, with a consumption of only 2.8lb. of coal per hour per horse power, goes a great way in favour of the point he wishes to establish. But there is a circumstance incidentally mentioned that may, perhaps, materially affect the comparison of his results with the work done by short-stroke engines in this country, and which I think merits the serious attention of those concerned in our transatlantic steamers. The fuel of which so small a quantity sufficed for the work of the *North America* was anthracite—an exceedingly compact kind of coal, which burns without smoke, and almost without flame, being free from sulphur or bitumen, containing from 90

to 96 per cent. of carbon, and the remainder water and slight earthy impurities. There are, of course, varieties of quality; but the best, which is very abundant, is compact mineral charcoal, so perfectly clean that it will not even soil a white handkerchief any more than a jet bead will. With regard to stowage, it lies in smaller compass than any other known variety of coal, and is at least equal in effect, weight for weight, with the very best bituminous coal; at least, if it be not equal, the advantages of long-stroke engines must be much greater than even "P. R. H." calculates them to be. Now this kind of coal is abundant in South Wales as well as in North America, and there can be no doubt but that it is equal in quality, as shown by experiments made on board a small steam vessel on the Thames by Messrs. Parker and Manby, and detailed in No. 865 of your periodical, while the method which they made use of in supplying the fuel saves three-fourths of the labour of the stoker, and entirely relieves him from the distressing effects of exposure to violent heat, while very little ashes are produced, and scarcely any clinkers. Notwithstanding all this, I am credibly informed not only that the *Great Western* and other transatlantic steamers constantly use bituminous coal, but actually send out cargoes of it to New York, for their use on the return voyage. Surely there must be some cause for this more than a mere dislike of innovation, or disinclination to copy Brother Jonathan, who, I fear, will set us down for "*tarnation fools*" indeed (to borrow an expression from "P. R. H.") if we cannot show something like a reason for our perseverance in so expensive an arrangement.

Perhaps some of your correspondents may be able to throw a little more light upon the subject; for if the adoption of this kind of fuel in sea-going steamers would be attended with anything like the advantages which I imagine must ensue, the saving to those which cross the Atlantic would be immense; and to those which only make short passages nearer home, would be such as to deserve the most serious consideration of their owners.

O. P. Q.

Winchester, October 24th, 1840.

THE ALLEGED ECONOMY OF AMERICAN STEAM ENGINES.

Sir,—We have been long accustomed to the American claim of superiority of speed in river steamers, but recently the claim brought forward in No. 890 of greater economy in the consumption of fuel deserves investigation—whether it is well founded, and if so, how far it may be considered decisive of the question of long and short stroke engines? Your correspondent, however, at New York, would confer a favour on some of your readers if he could add at his leisure the dimensions of the *North America*, her draught of water, area of midship section, &c.

The theoretical saving of fuel of engines of an equal power, worked by high steam expanded, and condensed when its pressure is reduced to one quarter of that of its admission into the cylinder, is about 50 per cent. in comparison with full pressure engines throughout the stroke, provided, of course, the boilers are constructed to admit of an equal water evaporation per lb. of fuel. It is obvious that the rule for horse power laid down in "Templeton's Engineers' Common-place Book" requires investigation, both as to its accuracy and also its coincidence with the rules used in England in expansion calculations. I conceive it is essential that the atmospheric pressure 14¾lbs., which is part of the actual load per square inch pressing on the safety valve, should be added to the boiler pressure of 50lbs., together making 64¾lbs. per square inch. The steam in the boiler resists the load on the safety valve, + atmosphere, and the pressure decreases inversely as the space from the total pressure.

Hence, admitting for an instant the impracticable condition of the equality of the boiler and cylinder pressure while the steam valve is open (since there is no evidence to determine the amount of difference), 64¾ × ,5966, the value of steam four times expanded in proportion to full stroke of the same steam, would give a mean pressure of 38,65lbs., from which the friction of the engine and the air pump, and imperfect vacuum resistances, must be deducted, to obtain the surplus pressure exerted on the shaft for calculations of horse power. The 29,82 lbs. mean pressure in the cylinder seems obtained by a similar

process in Templeton's rule, applied to the boiler pressure of 50lbs., and the addition of 5.75 appears to be the surplus pressure to condensation after the engine resistances have been provided for, making together a surplus cylinder pressure of 35.57 lbs. per square inch.

The result, I suspect, is an error in excess of not less than $\frac{1}{7}$th. I trust an appeal will soon be made to the Indicator in the United States, when I should not be surprised if the rule were found to be from $\frac{1}{6}$th to $\frac{1}{4}$th in excess.

The English rules, on the contrary, for the nominal horse power of low pressure engines, are usually allowed to be erroneous from $\frac{1}{4}$th to $\frac{1}{3}$rd, or even more, in defect.

In calling attention to the nature of Templeton's rule, for the calculation of horse power in American steamers, it should be observed that the merit of the boat is enhanced in proportion to the reduction of the horse power by which it is impelled.

A free and friendly exposition of facts on both sides of the Atlantic, I trust, will tend to a spirited rivalry in speed, and to more attention to the economy of fuel, and a correct system of estimating the horse power exerted by engines on the paddle shaft.

It would be a curious subject of inquiry in America how far the practical agrees with the theoretical saving of fuel to be expected in expansion engines, and how far the long stroke engine is advantageous for expansion. The question of the comparative merits of long or short strokes must be decided—not by the economy of coal, but by the economical application of the power derived from the evaporation of a given quantity of water.

I am, Sir, your obedient Servant,

S.

20th October, 1840.

IMPROVED PADDLE-WHEEL.

Fig. 1.

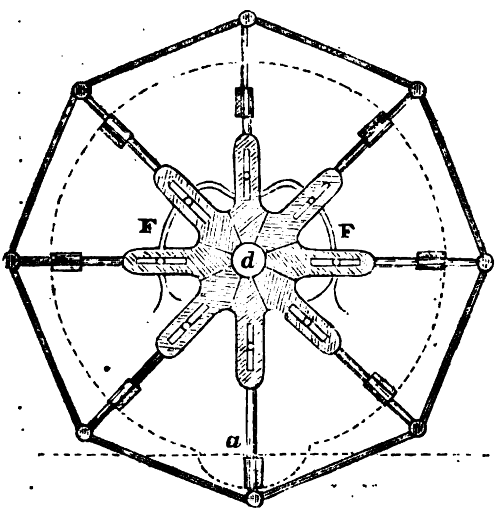
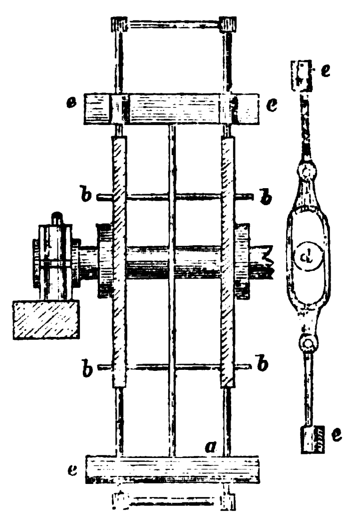


Fig 2.



Sir,—The steam boat propellers now in use I consider to be very imperfect, and I think every person who wishes well to steam navigation, should do his utmost to improve them. With that view I have taken the liberty to send you drawings of a paddle-wheel upon a principle which, I think will be both new and useful, if it can be adopted, of which I have but little doubt. If you, Sir, think there is sufficient merit to make them worth publishing in your Magazine, it will greatly oblige yours, &c.

THOS. WHITWORTH.

Royton, near Manchester, October 12, 1840.

Description of the Engravings.

Fig. 1 is a vertical view of the exterior framing of the paddle-wheel; fig. 2, a representation of the same partly in section, and seen endways; all the letters marked in the figures refer to similar parts. The one-half of the radial rods *a a*, next the circumference of the wheel are to be made round for the paddle boards to slide up and down upon them; the other half, next to the centre, are to be made flat, with slots for the reception of the guide rods *b b*, to slide within them, which are shown lengthways in fig. 2. These slots are to be double the breadth of the paddle boards. Fig. 3 is a longitudinal view of one of the rods to which the guide rods *b b*, are fixed at a given distance from the centre (four in number) which are seen edgeways in fig. 2. These rods have slots corresponding with those made in the radial arm of the exterior framing of the wheel, and slide up and down with the guide rods *b b*, while the crank shaft *d*, is revolving; at the ends of the rods are fixed the paddle boards *e e*. The guide rods *b b*, are seen extending through the slots made in the framing till their ends enter into what I term a concentrated groove F F, as shown in fig. 1, which may be made of wood, brass or iron. This groove must be fixed immoveably above the centre of the shaft to the side of the vessel.

A paddle-wheel upon this principle will not have the tendency to lift up the boat upon entering the water, nor will it make much back water in leaving it.

I have a drawing of a boat and propeller which I am of opinion will be better than either screw or paddle-wheel, and should be glad to show it confidentially to any respectable party through your medium, if they would be likely to bring it into use on approval.

Sir, I remain, yours, &c.,

T. W.

A QUESTION RESPECTING BLAST FURNACES.

Sir,—Many of your intelligent readers will smile at the following query: but two practical men are at variance on the subject, and will be obliged by a reply from one of your correspondents.

"If there are *two tuyere* pipes to a blast furnace of 4 inches diameter each, and the blast is compressed to a pillar of 3 lbs. on the inch, how many cubic feet of air are blown into the furnace in one minute?"

I am, your most obedient servant,

A CONSTANT READER.

October 26, 1840.

RAILWAY CARRIAGE LINKER.

Fig. 1.

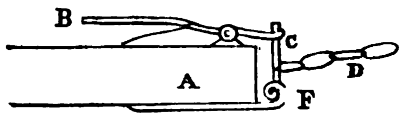
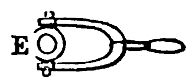


Fig. 2.



Sir,—Having seen the improved carriage linker described in your last number, I forward you the plan of one which I think superior in efficacy and simplicity.

Fig. 1, A is the carriage frame; B the lever, worked by the foot; C, the pin, by which the carriage is attached to the engine, having a joint at F. D, the chain, the end link of which has a swivel eye, shown at E, fig. 2, passing over the rim C. To release the train, all that is necessary is to press the lever B with the foot.

I am, Sir, yours, &c.

A BAKER.

Warwick-lane, Newgate-street.

REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS APPOINTED 7th FEB. 1840, TO ENQUIRE INTO THE EXPEDIENCY OF EXTENDING COPYRIGHT OF DESIGNS.

(Concluded from page 394.)

Mr. Joseph Lockett, of Manchester, is an engraver for calico printers; has been upwards of 20 years in that trade; his house is a very extensive one, it has been established upwards of 40 years. There is no other engraver in the same trade who carries on business to the same extent. He frequently employs above 100 persons, and pays nearly 200*l.* per week for wages. Both from his experience in point of time, and the extent of hiso wn business, he is perfectly cognizant

of every branch connected with engraving for calico printing. Is likewise acquainted with the state of trade on the Continent to a considerable extent. In every country where he has had business they invariably prefer the French designs, and they copy them extensively. In the last year he engraved above 300 patterns, not more than six of which were English, or could by any stretch of imagination be supposed to be of English invention. In the course of his visits to the Continent he has frequently heard them speak with the greatest contempt of English taste; and if he has shown them patterns, they have admired them for the execution, but quite ridiculed the idea of his getting orders for them. Has stated that in the year 1839 he produced upwards of 300 patterns, of which he thinks not more than six were English. In saying English, he had better explain himself: there are many patterns which he produces himself by peculiar modes of engraving, which are as much original as patterns can be drawn. They are his own invention; they are produced by machinery, and are such patterns as cannot be drawn; the machine that has to execute the pattern must of necessity invent it, because he could not follow an identical design. Cannot say that the pattern produced by this machine requires no previous design, or that it is accidental. If the machine was set to work it would continue producing the same pattern; but if witness makes a certain arrangement, which he does with a certain object, he produces a certain result; but he must previously conceive something. He can very often approximate very closely to what he conceives. If he puts a cylinder into the machine, and allows it to go on a little way, and just says to the workman, "You will remove this wheel, and put another in, and go on again," he has another pattern, corresponding with the idea in his mind. Sometimes he can scarcely foretel the result; in other cases he can approximate. The most successful designs he ever produced, as far as profit was concerned, have been by accident. The majority of patterns furnished to the Continental market, were produced by this machine, or were originals, or copies of the French. If a foreigner was to bring him an eccentric pattern, and ask him to produce the same pattern, he has such control over the machine he could at once set it to work with a certainty of producing a fac-simile; because he keeps an account of his patterns, and having a memorandum as to the arrangement of the wheels in the machine used in its production, he is in a condition at any time hereafter, by referring to those memoranda, to produce an exact fac-simile of the pattern. The machine is called an eccentric; it originated with his father, and has been perfected by himself; he has no patent for it. He is principally resorted to by foreigners for the eccentric groundworks. This eccentric groundwork, when applied to calico printing, is an elegant substitute for what is generally termed a blotch, and totally independent of the design that may be placed upon it; so much so, that the most favourite groundwork which Cobden and Co. of Manchester are using for their most elegant patterns has been used for the last six or seven years for the commonest prints that have been used, clearly showing that the groundwork is not of so much consequence. Does not think there is any more reason to apprehend the foreigner copying, provided the copyright be extended, than there is at the present moment from copying at home under the existing law. He considers that the competition at home is far more to be dreaded than anything abroad. He can give a reason why he thinks so: he thinks it has been previously explained, from what he understood as to what the process of engraving by a mill was, that you had to cut a die for the pattern before you could transfer it. Now there are frequently patterns of that sort; he could point to patterns which have been engraved by that process; they have been brought out by a house; they have been very successful patterns. When they entered into the hands of the party who copies, he would send for another engraver, not for witness if he had engraved them, because he would know that they would not do it; but a person whose purpose is copying must go on the most economical principle; it must be cheapness in this case that must give him his advantage; he sends for an engraver who will do it cheap, and this engraver will undertake the order for half the cost which it will take him to make the die. To cover which he goes to half-a-dozen other printers; he will send an impression of it to Glasgow; he will get an order for half-a-dozen rollers, from half-a-dozen different printers at the same price, say 5*l.* each, he would receive for the whole 30*l.*, which would answer his purpose very well, instead of which the originator had to pay four times that amount. Each of the parties who have got this roller commences printing with it, and they each bring their goods into the market at the same time. Immediately there is a race at underselling, who can get rid of their goods first. The consequence is that in many cases they sell at a loss, and injure the originator, making his original pattern almost valueless. These original patterns, which are copied, are probably three or four out of a dozen; the rest having been what are termed unsuccessful patterns. The good patterns are copied, the bad ones are left. In the case which he has in his eye while making this observation,

witness was paid 120*l.*; and the patterns which were left, and which were copied, were the only three or four out of the lot which succeeded, so that those three or four patterns would have cost between 30*l.* or 40*l.* each, and did, because they turned the other rollers off there ever having been a piece exposed or sold in the market. I cannot name the copyists, there have certainly been upwards of 20 persons who copied these patterns. They were of a class of patterns which were not very expensive, nor requiring much time to produce; their principal merit consisted in their simplicity and neatness. Considers they were decidedly original. Cannot say if they were copied before or after the three months; they have been copied by several houses, though they have been out for more than 12 months; in fact they are printing to this day, which proves the patterns were really good ones. These circumstances occurred two years ago, and the patterns are being worked now by those who copied them. Does not know if Messrs. Hoyle and Co., the originators, ceased to sell the patterns when they were copied. They complained bitterly of the extent of the injury done them. Mr. Benyon, the acting partner, came to witness the other day to consult with him upon producing some other patterns for the next season; but he said, "We are quite excluded from going into this simple style, they are so easily copied, and cost so little to the parties: can you give us anything that they cannot copy, for that seems to be our only protection." From his experience he considers the season lasts, generally speaking, more than three months; considers that a good pattern is valuable, or ought to be, for years. We have an instance in these very patterns that he has referred to—they are now engraving those very patterns for another house—but, according to the general understanding of the term, the season only lasts for a limited period, about three months. As an engraver, in the constant habit, and conversant with designs, he has never found any practical difficulty in deciding what was an original and what was a copy.

F. B. Long is officially employed as Registrar of Designs; that office has been in existence since July 1st, under the 2nd of Victoria, cap. 17. It embraces designs upon woven fabrics, but it does not embrace the designs of printers. Every class of design is protected, except those which are protected under the calico printing and lace. He finds there has been up to the present time 306 designs registered; there are 15 upon woven fabrics, besides carpeting and one ribbon. Believes the reason why parties have not availed themselves more extensively of this system of registration, is principally because they are not aware of the existence of the protection; but there are other reasons; there is the expense of registration, and also there is some inconvenience attending it. The expense is now three guineas on metal articles, and a guinea on others; it was originally three guineas on all, but was reduced in October last. The reduction was made in consequence of a memorial that was sent by the paper-stainers. Since the reduction there has been a very great increase in the number of registrations with respect to stained paper. There have been 152 designs registered on stained paper since the reduction. The fee of three guineas has been retained with respect to metal articles, because there is a greater extent of protection given to them. The number of designs registered on metal articles has been about 80, principally stoves. The number of paper-stainers registering, independent of the number of designs, has been seven, all London manufacturers. Attributes that circumstance for one thing to the facility afforded by their residence; another is, that they are better acquainted with it. Witness finds complaints existing against the excessive fees, from the manufacturers of figured silks. The fee in France for registering similar articles is, he believes, a franc for every year of protection. The 15 designs on woollen fabrics were only registered by two houses. Thinks the fee might be still further reduced, compatible with the maintenance of the office, and the efficiency of the registration. Has not formed any estimate in his own mind as to what minimum it might be reduced to; it is impossible to say, from the great variety of different articles for which designs are registered; from that circumstance it is difficult to say what they would come to at last. The amount of the fee rests with the Treasury. Conceives that leaving the power of fixing the amount of the fee as it is at present would contribute to an economical registration, so far as the interest of parties is concerned. The receipt of the fees does not at present pay the expenses of the office; the total receipts have been 556*l.* 2*s.* 6*d.*, and the total expenditure 424*l.* 11*s.* 6*d.*, but that does not include the rent of the office. Charges more for the registration of a design, the specification of which requires more writing, and extends over more pages than another; charges 5*s.* for each page. The process of registration is as follows:—First of all they require three drawings or copies of designs should be taken to them; two of these are placed in books, and the third is given back to the party, with a certificate pasted upon it of the design having been registered, and signed by witness; another certificate is also placed upon the design in the register. Previous to granting a certificate, never makes any enquiry as to the originality of the de-

sign; he always supposes the design is original when it is brought to him; for instance, in the case of a person which actually did occur, bringing me a design which consisted merely of the Queen's arms; of course I knew that was not original. Charges 5*s.* for searches; has frequently been applied to for that. Does not give the parties who ask to make searches a personal inspection; do that themselves. The only case in which they allow a party to see a design that is registered is when he brings one that is identical with it. The system of registration is now a close registry; it was not originally. Occasionally they had complaints against an open registry. Persons who came to register designs said they were unwilling that anybody should be allowed to come and pay 5*s.* and see all the designs that had been registered. They apprehended injury to their trade in consequence. Cannot say these complaints were very general; they were made in some instances. Has had one or two complaints since the registry has become close; one was from a patent agent; he considered it was a public office, and that anybody had a right to see the designs that were registered there; more particularly that he might guard himself against imitating any other person's design. Believes the practice at the Register-office in France is perfectly secret; the mode is this: the pattern is enclosed in a box, and that box is sealed, and is deposited in the Registry-office, and the box is only opened in case the copyright is disputed. That practice might readily be adopted in this country if secrecy were desirable, but witness thinks it would be attended with very great inconvenience. In case of litigation it would be inconvenient, because in that case it would be necessary to send the sealed pattern down by an officer belonging to the establishment. Thinks that two copies would be quite sufficient instead of three, but thinks the obligation of marking the articles would in some cases be productive of inconvenience, at least so he understands from the parties. There have been many complaints of the expense attendant upon the lodgment of three designs. It may be that some of the designs are of such a character, and cost so much, that it becomes a very serious source of expense to the designer; but he should think that merely a trace copy would be sufficient, which would not be so expensive. Should think that the registration would be equally efficient if the depositor of a design had the option of depositing either an actual specimen of the article, or a drawing upon paper, or in the case of woven fabrics a pattern or piece of cloth. At the present moment the law requires on each article deposited for registry, and on each article or piece published subsequently, the date and the number of the proprietor, which has been much complained of. In some cases the complaints have been of the inconvenience and impossibility of marking some of the articles, and in other cases of the date, which they say injures the sale of the article. Witness thinks that merely putting a number, with the word "registered" upon it, would be compatible with perfect security. Since the office has been opened, he believes one or two cases of copying have occurred; but they were not tried. He was in communication with the parties on the subject, but does not know how those cases were settled.

Mr. Cornelius Boyle, is in the firm of Williams, Coopers, Boyle, and Co., paper-stainers, West Smithfield; the present proprietors have been in partnership more than 30 years; their house is one of the most extensive in the trade. Thinks the highest amount of duty paid by them in one year is between 5,000*l.* and 6,000*l.* Nearly 200 hands are employed at their works; last year they produced nearly 200 pieces of paper-hangings, each 12 yards long and 21 inches wide. They never cease preparing designs; whenever they meet with a pattern that is approved they order it; it is then put into a state of progress till it is required. They show their patterns generally in the month of October or the beginning of November, to obtain orders for the employment of their workmen during the winter. They send out their travellers in October or November. Their delivery commences the first or second week in February, at which time the orders they have executed during the winter are delivered at the same time with the patterns; the orders are usually kept back till the delivery is ready. They begin to execute orders immediately they are sent home by our travellers, and they remain in their warehouse pretty generally until the patterns are ready in the spring, as there is no paper-hanging business going on during the winter months. It is not the custom among paper-stainers to employ designers on their own premises. The trade of designer for the paper-stainer is a distinct branch of this profession. The design is not estimated; they pay so much for the blocks, when they are in a fit state for use. What they term the pattern-drawer, or the designer, and the block-cutter, are one and the same person; the block cutting is not a distinct branch of business in this country, it is subordinate to the pattern drawer. They use three sizes of blocks, but all are 21 inches wide; the others vary in length from 10½ to 15¾, or 16 inches; others are 21 inches square. Witness cannot state the cost of the design separate from the blocks; the persons of whom they purchase the blocks will not set

a value on the designs; they will not sell them; they attach a value to the twofold operation, occupation of drawing and cutting, and will not separate the one from the other. Their general expense for blocks varies from 1,000*l.* to 1,500*l.* a-year. Having chosen the designs and purchased the blocks, they commence printing previous to sending their travellers out. Every pattern has to be struck off in five or six, and sometimes ten different sets of colours, in order to select those most suitable for the market. Should consider the impressions for their travellers do not cost less than 300*l.* or 400*l.* each journey, that is, twice a-year. The blocks of the pattern now exhibited cost 100 guineas, and the impressions for patterns alone cost 200 guineas. Should say in all cases the patterns cost as much as the blocks, but in most cases more. Spring and summer are the principal seasons for the sale of their goods; the general sale commences in March and closes in October. The duration of the sale of a pattern varies much; they have patterns now selling that are 20 years old, and they have others that are quite new that are not selling at all. Should take the average of a moderately successful pattern at from three to five years. At present they have a protection in these designs for 12 months, coupled with a system of registration, but in its present form they have no intention of ever registering another pattern; their objection to it is the extreme trouble of working it out, and the objection made by a great majority of their connexions to their name being emblazoned on the pattern. They have in many instances had their patterns returned to them not exhibited, in consequence of their name being so stamped upon them. Thinks if an alteration was made in the system of registration, and instead of the name a cypher was substituted, that objection would be removed. They cut up 9,000 pieces of paper annually, which cut into 180,000 patterns; on each of these, which are given away, there must be that impression. They make 200,000 pieces annually; on each of those pieces must be an impression also; so that the trouble and expense is greater than the benefit they derive from such limited protection. The date of the registration of the pattern proves the age of it, and their customers will not show a pattern that is not a new one. Object to their pattern in the registry being made public; should prefer a secret registration. The fee on registration is one guinea; thinks it greatly too much. Witness's objections to the present system of registration are, 1st, the impression of the name of his firm on the paper; 2ndly, the impression of the date of its production; 3rdly, its being an open register; and, 4thly, the excess of the fee. Before the passing of Mr. Poulet Thomson's Act, their property in their pattern was very seriously injured by copying; has no knowledge of any of their registered patterns having been copied. In copying one of their patterns, the copyist getting rid altogether of the charge of design, and employing inferior block-cutters, could produce the pattern at one half the original cost. The copyist has all the advantages of their skill and taste in the selection of colouring and adapting the patterns to the prevailing fashion; he is at no expense in sending out patterns, but executes orders from witness's specimens. He likewise uses inferior paper, colours, and workmanship. The papers may vary 20, 30, or 40 per cent.; in the colours there may be a variation of 200 or 300 per cent. In some cases witness has known the copyist to undersell him 50 per cent. Does not apprehend any ill effects from foreign competition in the event of the extension of copyright. It is difficult to say how many persons are employed altogether in England in the production of paper-hangings; but there must be several thousands, perhaps 3,000 or 4,000 altogether, connected with it. If an adequate term of copyright was given, they should be very ambitious to employ a higher class of artists; should consider it must have that tendency. The extension of copyright, by giving protection for such a length of time, would remunerate them for the great cost of their outlay; not less than three years would be sufficient to produce that effect. It would be reasonable, even for a cheap simple pattern, that there should be an extension of three years' copyright; their patterns do not come into operation with the public until the second year, and very many of them not until the third year. It is not as with garments or dresses, that merely pass off with the season. Their article is an article of furniture; and papering is not done in this country, but when painting and other repairs are going on in the house. It frequently happens that a pattern which is at first unsaleable subsequently becomes a favourite with the public after a lapse of time; the term of copyright having expired before the public have stamped it with favour, there is no prohibition to the copier—no protection for the proprietor. The pattern produced was brought out in 1831, but did not sell; it sold in 1832, and sold twice as much in the year 1833 as in the two previous years. The sale has continued up to the present time, and it has been copied by at least 20 houses. It was not copied until the second or third year; it was an entirely new style, and therefore it was not known whether the public would patronize it. Any protection for less than three years would be an outlay without any advantage; and they, as a house of extensive business, should not avail themselves of it.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

EDWARD THOMAS BAINBRIDGE, PARK PLACE, ST. JAMES'S, GENTLEMAN, *for improvements in obtaining power.*—Enrolment Office, October 12, 1840.

An open topped cylinder is placed vertically and fitted with a piston and piston rod, strong and heavy enough to overcome the friction of the piston in the cylinder; an inverted cylinder is placed on the top of the piston-rod, and below it a fixed piston, through which the beforenamed piston-rod works as in a guide. A series of teeth are sunk in the surface of the piston-rod, to which a wheel is adapted, having corresponding projecting teeth on a portion of its circumference, the other part being plain. This wheel being caused to revolve, by some applied force, the teeth take into the rack of the piston-rod and elevate it, causing a vacuum to be formed beneath the piston; but by the time the piston is at the top of the cylinder, the teeth of the wheel become disengaged, and the plain periphery presented to the piston-rod; the consequence is, the atmospheric pressure as well as the gravity of the parts, dashes the piston violently down to the bottom of the cylinder. In order to counteract the injurious tendency of this motion, the upper cylinder attached to the piston-rod, comes down upon the stationary piston, and enclosing a certain quantity of air, its compression modifies the violence of the shock, and by its elasticity assists in the subsequent elevation of the piston, &c. A fly-wheel is introduced to diminish the irregularity of the motion thus generated, which is to be communicated to machinery in the usual manner. This inventor and improver, claims, first:—the method of obtaining power by taking advantage of the force of accelerated motion caused by gravitation, in connection with a rush of atmospheric air into a vacuum. Secondly, the use of an elastic body to aid the return of a piston, upon which the rush of atmospheric air has exerted its power when rushing into a vacuum. This *shocking* contrivance belongs to the era of the perpetual motion seekers, and it is mortifying to us, after the pains that we and many cotemporaries are continually taking to disseminate better notions, to see such absurdities seriously entertained. After a sufficient quantity of extraneous power has been applied to drive this rude and cumbrous arrangement of mechanism, how much *power* will be *obtained?* Most assuredly, by these *improvements*, the *gain* will be a *loss!*

WILLIAM UNSWORTH, OF DERBY, SILK LACE MANUFACTURER, *for an improved tag for laces*, Enrolment Office, October 14, 1840.

This improvement is of a very paradoxical character, inasmuch as it relates to the formation of tags for laces in such a way, that the tag is "prevented from coming off the lace," and yet the wearer is said to be able "to supply a new tag at pleasure!" The mode of performing this improvement, is by striking the tag, either before or after* it is on the lace, with a pointed punch, (triangular being recommended) so as to form a burr on the inside, which holds the tag upon the lace. The oldest of our readers will recognise this process as one that has been already employed for securing tags to laces, ferules to sticks and umbrellas, &c., for the term of their natural lives; and we think it not very fair that a monopoly of this convenient process should be *attempted* to be set up at this particular time.

SAMUEL MARLOW BANKS, OF BILSTON, STAFFORDSHIRE, GENTLEMAN, *for improvements in the manufacture of iron.* Enrolment Office, October 14, 1840.

This improvement consists in the introduction of powdered slack, coal, coke, charcoal, limestone iron ore, &c. into the furnace with the blast. For this purpose, over a flange on the blast-pipe, a hopper is placed, the communication being regulated by a stop-cock fitted to the flange. The requisite materials being broken into small pieces, are put into the hopper through a screwed lid provided for that purpose. A small tube from the blast pipe communicates with the upper part of the hopper, so as to allow the contents of the hopper to fall by their unimpeded gravity when the stop-cock is opened. On turning the cock, the coal, &c. falls from the hopper into the blast-pipe, and is carried into the furnace. When the hopper has been emptied, the cock is turned off, the lid unscrewed and a fresh charge supplied, and the operation repeated. The patentee does not confine himself to this particular form of apparatus, but claims—"the mode of conveying solid particles into the furnace with the blast, be it either hot or cold."

WILLIAM POTTS, OF BIRMINGHAM, BRASS FOUNDER, *for certain apparatus for suspending pictures and curtains.*—Enrolment Office, October 15, 1840.

Consisting in a mode of constructing apparatus whereby pictures, curtains, &c. may be suspended with great facility, and pictures varied in position from time to time at pleasure. Two tubes hang perpendicularly from a cornice hereafter described; throughout the length of these tubes, at regular distances there are a series of holes, so formed as to allow a stud or button to be placed through the large opening and sink into the lower narrow one, whence it cannot be removed until it is raised. Two studs or buttons, having

* We *should recommend* after. ED. M. M.

hooks on their faces, are placed in two lower holes of the vertical tubes, upon which the picture hangs, by rings fastened to the lower part of the frame. To the back of the upper part of the picture frame, a piece of tube, similar to the vertical one, is affixed, but the holes run right and left from the centre with rings at each end. Two studs carrying small pullies are placed in the vertical tubes on a level with the picture; a small cord passes through both these pullies, and each end being brought through the rings before mentioned are attached to two studs, which, being placed in appropriate holes in the horizontal tube at the back of the picture, support it at any required angle from the wall. In this arrangement, it will be requisite to employ a step ladder, to get at the top button to alter the angular position of the picture: to obviate this, it is proposed to use a longer cord passing through four pullies down to a small windlass, and attached by a stud to the vertical tube near the bottom of the picture. By winding or unwinding this cord the picture is placed at a greater or less angle from the wall with ease. The graduated rods or tubes, may be in the form of a descending ornamental chain (several beautiful drawings of which accompany the specification,) all that is necessary, being to preserve an uniform horizontal position of the corresponding openings; the mode of suspending them is by the upper part being hook shaped, and sliding on an iron rail placed round the room, concealed by a handsome brass moulding. When heavy weights are to be carried, whether of pictures or curtains, two flat surfaces or rails are formed upon which an elongated carriage runs freely by means of two antifriction pullies; a stem descending between the rails and terminating in an ornament, carries the curtains. For small pictures, connecting rods may be attached to the vertical suspenders, and the picture attached to them. These improvements are intended to be applied to all kinds of house or bed curtains, and to supersede the use of the ordinary rods and rings. The claim is—1. The mode of constructing apparatus for suspending picture frames, as shown in 11 figures accompanying the specification. 2. The mode of constructing apparatus for the suspension of curtains.

William Crane Wilkins, of Long Acre, and Matthew Samuel Kendrick, of the same Place, Lamp Manufacturers, *for certain improvements in lighting, and in lamps.* Enrolment Office, October 28, 1840.

The first of these improvements relates to the construction and use of Argand lamps; from the oil cup at the base of the burner, an inner tube rises, having on its exterior surface a spiral groove or worm: the outer case, or tube, has a groove cut vertically on its inner surface; the cotton holder has a projecting peg at each end, one of which takes into the spiral groove, and the other into the vertical, whereby the holder is made to move upwards or downwards when motion is communicated to the inner tube by turning round the oil cup. In this way, the cotton wick and flame of the lamp may be adjusted from time to time, without removing the glass or glasses, while, by having no separate inner revolving case or racks and pinion, diminution of bulk in the burner, as well as increased stability are obtained. Seven different forms of glass chimnies are set forth, in which the diameter of the chimney is contracted in such a manner, as to incline the ascending column of air towards the flame of the lamp, whereby more perfect combustion and increased light is obtained. (This appears a very excellent sort of lamp, and in a subsequent number we shall give a drawing and more particular description of it.) The second improvement, relates to a new method of feeding or supplying oil to the reservoirs of Argand lamps; these lamps as usually constructed, unscrew at the base of the cistern, which has to be disconnected and inverted every time a fresh supply of oil is required. This is proposed to be obviated, in pillar lamps, by using two reservoirs for oil in connection with an air chamber placed below; the upper reservoir is furnished with a valve, which, when opened, allows the oil to descend into the air chamber; the air thus displaced rushes up a pipe, and acting on the surface of the oil in the middle reservoir, forces it up to the burner, which is thus continually supplied—being an ingenious application of Hero's fountain to this purpose. In wall, or hanging lamps, the oil cistern, or principal reservoir, communicates by means of a valved opening with a supplementary cistern on a level with the top of the burner. Oil is supplied through an opening in the top of the cistern, closed with a screw cap; when the lamp is lighted, the valve being opened, the oil fills the secondary cistern and rises to the level of the burner; in proportion as the oil is consumed, a continuous supply escapes from the larger into the smaller cistern, and thence to the burner. A rod passes from the valve, through a tube to the top of the reservoir; both that and the orifice of supply being concealed by an ornamental casing with which they are covered. The third improvement consists in an improved mode of constructing concentric wick lamps; the circle for holding the wicks, instead of being made of pieces of tin turned over into a ridge at top, are made of one piece of iron, without any ridge, whereby all risk of leakage is avoided. Vertical wires screwed at the end and acted uopn by nuts, raise or lower the cotton. The fourth improvement relates to gas burners, and consists in the introduc-

tion of one or more perforated diaphragms inside the burner, which is stated to cause the gas to issue in a more equal and uniform manner from the burner. The fifth and sixth improvements relate to signal lights of different colours for steam-vessels, railway stations, &c., that their relative positions may be instantaneously changed, so as to prevent any mistake arising. An argand lamp is gimbled and placed in a reflector with a white glass, in a suitable frame a little above the bow of the vessel. Another lamp with a bright red or other coloured light is similarly mounted over the first, at the extremity of a pole, so centred as to turn either to the right or left, but hanging perpendicularly when at rest, by means of a weight. By means of ropes the red lamp can be inclined to the one or other side of the white light, and thus clearly indicate whether the vessel is on the starboard or larboard tack. Finally, the application of lenses of various coloured glasses, which are made hollow, and slip on to the glass chimney of the lamp when wanted. The claims are:—1. The improved construction of argand lamps, and also the glass chimneys before referred to. 2. The method of feeding table, wall, and other lamps. 3. The construction of concentric wick lamps in the manner described. 4. The addition of perforated diaphragms or other analogous substitutes, to the inside of gas burners. 5. The mode of fixing and working signal lights, as set forth. 6. The employment of moveable lenses to slip over the glass chimneys of lamps, when different colours are required to be used.

LIST OF DESIGNS REGISTERED BETWEEN SEPTEMBER 25TH AND OCTOBER 27TH:

Date of Registration.		Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Sept.	28	416	J. Yates	Table	3 years.
	"	417	Ditto	Framework for a steam engine	3
	"	418	J. Rodgers and Sons	Contracting clasp	3
	29	419	C. Rowley and J. Smeeton	Button	3
	30	420	J. Simister	Shoulder strap	3
Oct.	2	421	C. Goodall and Son	Engraved metal roller	3
	5	422	F. Harrison	Linen drill	1
	8	423	R. Jones and Son	Corkscrew	3
	"	424,5	H. B. Elwell	Lantern	3
	12	426	Watson and Son	Carpet	1
	13	427,8,9	J. and J. Walker	Cantoon	1
	"	430	G. Jackson and Sons	Frame for pictures, &c.	1
	14	431	J. Ridgway	Machine for burnishing china, &c.	3
	16	432	Aspinall and Cross	Grand drill	1
	19	433	The Coalbrookdale Company	Stove	3
	20	434	T. B. Wright	Dial for railway time tables	3
	22	435,6,7	J. Rostron	Cantoon	1
	23	438	Rotton and Scholefield	Castor	3
	"	439	H. Gardner	Spectacles	3
	26	440	W. Mosey	Envelope	1
	27	441	J. Fisher	Strap fastening	3
	"	442	The Coalbrookdale Company	Fender	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 26TH OF SEPTEMBER AND THE 22ND OF OCTOBER.

Frederick Payne Mackelcan, of Birmingham, for certain improved thrashing machinery, a portion of which may be used as a means of transmitting power to other machinery. October 1; six months.

Thomas Joyce, of Manchester, ironmonger, for a certain article which forms or may be used as a handsome nob for parlour and other doors, bell pulls, and curtain pins, and is also capable of being used for a variety of useful and ornamental purposes in the interior of dwelling-houses and other places. October 1; six months.

William Henry Fox Talbot, of Lacock Abbey, Wilts, Esq., for improvements in producing or obtaining motive power. October 1; six months.

William Horsfall, of Manchester, card maker, for an improvement or improvements in cards for carding cotton, wool, silk, flax, and other fibrous substances. October 1; six months.

James Stirling, of Dundee, engineer, and Robert Stirling, of Galston, Ayrshire, doctor in divinity, for certain improvements in air engines. October 1; six months.

George Ritchie, of Gracechurch-street, and Edward Bowra, of the same place, manufacturers, for improvements in the manufacture of boas, muffs, cuffs, flounces, and tippets. October 1; six months.

James Fitt, sen., of Wilmer Gardens, Hoxton Old Town, manufacturer, for a novel construction of machinery for communicating mechanical power. October 7; six months.

John Davies, of manchester, civil engineer, for certain improvements in machinery or apparatus for weaving, being a communication. October 7; six months.

Thomas Spencer, of Liverpool, carver and gilder, and John Wilson, of the same place, lecturer on chemistry, for certain improvements in the process of engraving on metals by means of voltaic electricity. October 7; six months.

Thomas Wood, the younger, of Wandsworth Road, Clapham, gentleman, for improvements in paving streets, roads, bridges, squares, paths, and such like ways. October 7; six months.

Charles Payne, of South Lambeth, Surrey, gentleman, for improvements in salting animal matters. October 13; six months.

Robert Pettit, of Woodhouse-place, Stepney-green, gentleman, for improvements in railroads and in the carriages and wheels employed thereon. October 15; six months.

Henry George Francis, Earl of Ducie; Richard Clyburn, of Uley, engineer; and Edwin Budding, of Densley, engineer, for certain improvements in machinery for cutting vegetable and other substances. October 15; six months.

William Newton, of Chancery-lane, civil engineer, for an invention of certain improvements in engines to be worked by air or other gases, being a communication. October 15; six months.

James Hancock, of Sidney-square, Mile-end, civil engineer, for an improved method of raising water and other fluids. October 15; six months.

Henry Pinkus, of Panton-square, Esq., for an improved method of combining and applying materials applicable to formation or construction of roads or ways. October 15; six months.

Charles Parker, of Darlington, flax spinner, for improvements in looms for weaving linen and other fabrics to be worked by hand, steam, water, or any other motive power. October 22; six months.

Richard Edmunds, of Banbury, Oxford, gentleman, for certain improvements in machines or apparatus for preparing and drilling land, and for depositing seeds or manure therein. October 22; six months.

Thomas Clark, of Wolverhampton, ironfounder, for certain improvements in the construction of locks, latches, and such like fastenings applicable for securing doors, gates, windows, shutters, and such like purposes, being a communication. October 22; six months.

Gabriel Riddle, of Paternoster-row, stationer, and Thomas Piper, of Bishopgate-street, builder, for improvements on wheels for carriages. October 22; for the term of seven years, being an extension of the original letters patent granted to Theodore Jones, of Coleman-street, accountant.

LIST OF PATENTS GRANTED FOR SCOTLAND FROM 22ND OF SEPTEMBER, TO 22ND OF OCTOBER, 1840.

John Lambert, of No. 12, Coventry-street, in the parish of Saint James, Westminster, gentleman, for certain improvements in the manufacture of soap. (A communication.) September 24.

James Buchanan, merchant, of Glasgow, for certain improvements in the machinery applicable to the preparing, twisting and spinning, and also in the mode of preparing, twisting and spinning of hemp, flax and other fibrous substances, and certain improvements in the mode of applying tar, or other preservative to rope and other yarns. September 24.

Alexander Francis Campbell, of Great Plumstead, Norfolk, Esq., and Charles White, of Norwich, mechanic, for improvements in ploughs, and certain other agricultural improvements. Sept. 29.

Amand de Plangue, of Lisle, in the kingdom of France, but now residing at 126, Regent-street, Middlesex, gent., for improvements in looms for weaving. (A communication.) September 29.

George Delianson Clark, of the Strand, Middlesex, gent., for improvements in coke ovens. (A communication.) October 5.

Richard Beard, of Egremont Place, New Road, Middlesex, gent., for improvements in printing calicoes, and other fabrics. (A communication.) October 7.

Robert Beart, of Godmanchester, Huntingdon, miller, for improvements in apparatus for filtering fluids. October 14.

Thomas Farmer, of Gunnersbury House, near Acton, Middlesex, Esq., for improvements in treating pyrites to obtain sulphur, sulphurous acid, and other products. October 14.

LIST OF IRISH PATENTS GRANTED FOR OCTOBER, 1840.

H. C. Rouquette, for a new pigment.

John Hawley, for improvements in pianos and harps.

W. Stone, for improvements in the manufacture of wine.

F. Vouillon, for improvements in the manufacture of ornamental woven fabrics.

M. Poole, for improvements in looms for weaving

J. Lambert, for certain improvements in the manufacture of soap.

NOTES AND NOTICES.

Wood Tyre for Railway Wheels.—Sir,—Although Mr. Dircks is entitled to all the solid advantages, arising from the practical adaptation of the foregoing principle, it is quite clear, that the merit of invention belongs to Mr. John Rivington, jun., whose suggestion to that effect appeared in No. 819, April 20, 1839. The mode of construction adopted so successfully by Mr. Dircks, is highly creditable to his engineering skill, but to the "novelty of idea" he must resign all pretensions, upon the incontrovertible evidence of your pages. Yours obediently,

October 14, 1840. W. B.

New Floating Fire-engine.—A floating fire-engine of great power is now building for the Emperor of Russia, by Mr. Merryweather, engineer, Long Acre, London; it will be worked by four cranks, manned by upwards of fifty men. The engine will be placed in an iron boat, now in course of erection at Messrs. Fairbairn and Co.'s works, which will be propelled by two paddle-wheels driven by the same cranks that work the engine, suitable gearing being employed for transferring the motive power to either at pleasure, upon the plan suggested by Mr. Baddeley in No. 588 of the *Mechanics' Magazine*. This powerful machine will combine several novel and important improvements, and in the facility and rapidity of its transport, as well as in readiness and power of working will greatly exceed anything hitherto seen in this country.

Extraordinary Despatch in Fitting up the "Polyphemus" Steam Frigate.—It will be recollected that the steamer of war *Polyphemus*, of 800 tons burthen, was launched at Chatham on Monday, the 28th of September, the same day that the *London*, of 92 guns, was launched. The former vessel proceeded upon the following Thursday, the 1st of October, to the engineering establishment of the Messrs. Seawards and Capel, of London, who have completely equipped this fine vessel with engines of 200 horses power, with all her fittings, spare gear, implements, and stores, and coal-boxes of wrought iron to contain 229 tons of coals, in the short space of 22 working days. We believe this is the shortest time upon record of a vessel of this magnitude having been fitted. She proceeded down by steam to Chatham on Wednesday, the 28th inst., to take in her masts, being quite completed in her machinery. It is considered that it would require a period of six months in any port out of Great Britain to fit a vessel of war of the same size. There were about 220 men employed by the Messrs. Seawards on the vessel. Her engines are upon the same system as those of the *Gorgon*, *Cyclops*, *Alecto*, and *Prometheus*. The *Polyphemus* will be immediately armed with two 10-inch guns, and will proceed direct to the Mediterranean.

LONDON: Edited, Printed and Published by J. C. Robertson, at the Mechanics' Magazine Office, No. 166, Fleet-street.—Sold by W. and A. Galignani, Rue Vivienne, Paris.

Mechanics' Magazine,

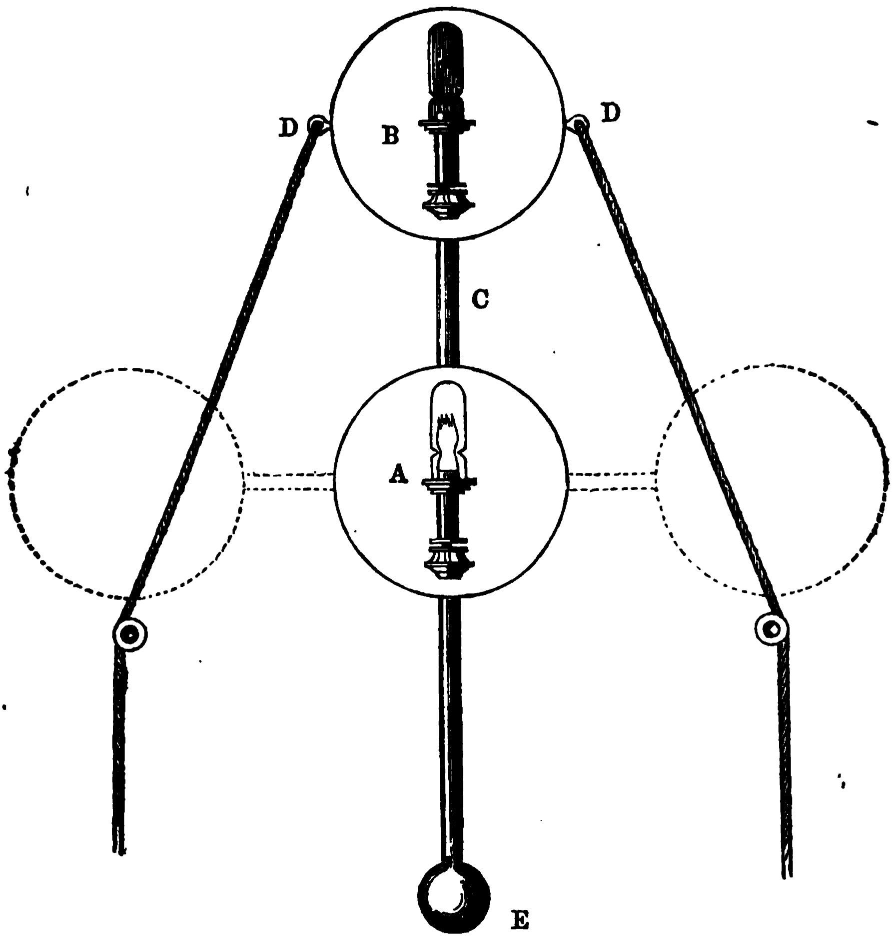
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 900.] SATURDAY, NOVEMBER 7, 1840. [Price 3d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

WILKINS AND KENDRICK'S IMPROVEMENTS IN LAMPS.

Fig. 1.



WILKINS AND KENDRICK'S IMPROVEMENTS IN LAMPS.

In our last Number we gave an abstract of the recent specification of Messrs. Wilkins and Kendrick for certain improvements in lighting and in lamps, and we now return to the subject in order to redeem the promise which accompanied that abstract.

The engraving on our front page (fig. 1) illustrates a very beautiful, and at the same time a very simple mode of exhibiting signal lights of different colours, the employment of which on board of steam vessels, at railway stations, and in various other places, is calculated to avert continual sources of danger. The late fearful collision between the *Phœnix* and *Britannia*, shows the necessity that at present exists for some judicious and well-understood provision of this kind, by which such deplorable accidents might be prevented. The Corporation of the Trinity House have recently framed and promulgated the following "rules of the road" for preventing any future misunderstanding on this point, which, on communicating with the Lords Commissioners of the Admiralty, the Elder Brethren find have been already adopted in all the steam vessels in her Majesty's service:—

"1. When steam vessels on different courses must unavoidably or necessarily cross so near that, by continuing their respective courses, there would be a risk of coming in collision, each vessel shall put her helm to port, so as always to pass on the larboard side of each other.

"2. A steam vessel passing another in a narrow channel must always leave the vessel she is passing, on the larboard hand."

The advantage of having some ready mode of showing that these regulations are known and will be observed, as also of enabling approaching vessels clearly to see the tack on which each is standing, will be at once recognized. There is a great superiority in moveable over fixed lights, in the extent to which they can be made useful as signals for these and other purposes. The manner in which all these advantages are realized by the patentees in this instance will be clearly perceived on reference to the engraving, with the aid of the following brief description:—

An argand lamp A is gimbled and placed in a reflector with a white glass chimney, and fixed by means of suitable framework a little way above the bow of the vessel. A second lamp B, similarly gimbled, is placed within a reflector, and fitted with a *red* or other bright coloured glass chimney. This lamp is affixed to the upper end of a pole C, so as to be supported immediately over the lamp A. The pole moves freely upon an axis placed in its centre, so as to be readily inclined either to the right or the left, but when left to itself it preserves its vertical position, in consequence of a weight E being attached to the lower end of the pole. Two ropes are attached to the rings D D, by pulling of which the lamp B can be brought down to a level with the lamp A on either side, and thus be made to indicate that the vessel is keeping either the starboard or the larboard tack. When the rope is released, the action of the weight E restores the lamp B to its original upright position. The mode of showing a coloured light, by means of coloured glass chimneys, (noticed in our last) strikes us as being a novel and ingenious contrivance.

Having thus noticed one of the useful applications which may be made of the lamp, we now proceed to point out some of the peculiarities and improvements embodied in the construction of the lamp itself.

Fig. 2 represents an improved wall, or hanging lamp upon Argand's principle. As hitherto made, the oil reservoir has always had to be unscrewed from, or lifted out of the case of the lamp, and to be inverted in order to fill it with oil; an operation which is hardly ever accomplished twice without spilling and wasting the oil, to say nothing of the uncleanliness of the operation. In Messrs. Wilkins and Kendrick's lamp, the principal reservoir F, is filled with oil through an orifice *f* at the top, closed by a screw cap; the oil is admitted through a valve or cock *g*, into a secondary reservoir, the top of which is a little higher than the top of the burner H. On opening the valve *g*, the oil fills the secondary reservoir and flows through the pipe I into the burner H, till it attains the same level in both. In proportion as the oil is consumed, the oil passes from the upper to the lower reservoir, and thence to the burner, where the level

Fig. 3.

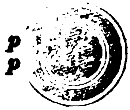
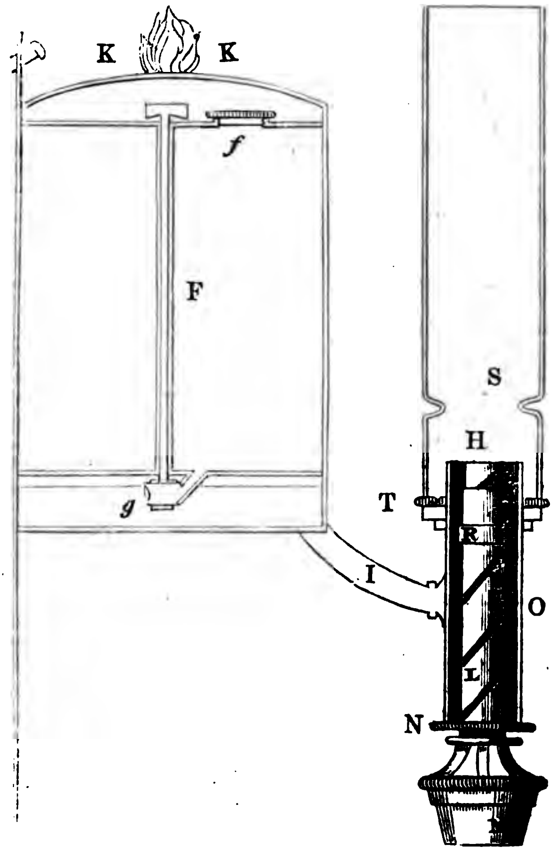


Fig. 2.



is constantly maintained without any overflow. The orifice for filling *f*, and also the handle of the valve, may be concealed by an ornamental cover K K, removeable at pleasure. The burner is altogether novel in its construction. An internal tube L is connected with, and rises from the oil cup M, held by, and turning freely within a ring N. On the external surface of the tube L a spiral groove is cut from top to bottom. O is the outer case of the burner, having a groove formed on its inner surface, by two strips of metal, shown in section by *p p*, fig. 3. R is the cotton holder, having a pin or peg passing through it, which takes into the vertical, and also into the spiral grooves, so that when the oil cup M is turned, the cotton holder moves up or down according to the direction in which motion is given. By this simple arrangement, the flame of the lamp may be adjusted without taking off the glasses, and the consequent risk of breaking is therefore entirely obviated: while from there being no inner revolving case, nor rack and pinion, the tubes of the burner are made smaller and more compact than usual. S represents a glass chimney of one of the improved forms included in the patent, resting on the gallery T. This form of glass causes the ascending column of air to incline towards the flame, rendering the combustion exceedingly perfect, and evolving the greatest possible quantity of light.

CURIOUS PNEUMATIC PHENOMENON.

Sir,—If you should consider the following account of a trifling but curious experiment worthy of a corner in your pages, I shall feel much obliged by your inserting it.

Some time since, while making some pneumatical experiments, merely for amusement, I took a white earthen jar and cover, of the same kind as those used by chemists for extracts, &c., and filled it with water; and, putting on the cover, I inverted the jar and placed it on a table; when, of course, I was not at all astonished to find that the water remained in the jar; for, under these circumstances, the cover of the jar merely replaced the saucer, which lecturers use when they transfer gases from place to

place, though, it must be confessed, that the cover is a very greatly improved substitute for the saucer. It now occurred to me, that if the jar was lifted from the table by the now upper end of it (or by that which would have been its lower end if it had not been inverted), the water would not run out of the jar, but that the cover would follow the jar, the water remaining in the jar. I made the experiment, and found my idea was justified by the result.

I am not aware that this partly pneumatical experiment has ever been before made, it being with me entirely original. It is not dependant upon any sticking between the jar and cover, for, if the cover be slightly touched, it will be seen that there is no contact between the jar and cover, but, on the contrary, a film of water between them. I have used various sized jars, and found the same result ensue with all; but the largest jar has not been greater than 5 inches in height, and 3½ inches in diameter.

The experiment will not generally succeed if the jar be not held upright, nor will it if, in lifting the jar from the table, there should be any adhesive action, by a layer of water or otherwise, between the table and the cover of the jar. In order to obviate this source of failure, the jar may be raised from the table by placing one hand under the cover, and when the jar is at a proper height, by removing the hand from under the cover, holding the jar by the other hand. But, from some of the proper conditions of the experiment not being always accidentally fulfilled, the cover will sometimes fall off, and the water splash about. In order to avoid inconvenience in this respect, I should advise that the experiment be always made over a wooden tub or pail.

It does not seem to me at all difficult to explain the causes of the sticking result of this experiment; but as by far the greater part of your readers will be able to arrive at an explanation of themselves, I do not give any further than saying that the experiment is not purely pneumatical.

With every apology for trespassing upon your space,

I remain, Sir, your humble Servant,

J. P. Holebrook.

118, Devonshire-place, Edgeware-road,
21st October, 1840.

THE NEW THEORY OF THE UNIVERSE.—(VIDE PAGE 409, NO. 898.)

Sir,—It would not be difficult to answer the question of "E. A. M.," without his theory, respecting the billiard ball; but he informs us (vol. xxxiii, page 366,) that he is no mechanic, and in accordance with his theory, many things appear to him in a different light to that in which they are viewed by others—and he finds these many things are not well understood by any one. Now he tells us, as he is no mathematician, that he is desirous of having his question answered in plain English—but who is he then, and what is that plain language he will be disposed to understand? Have I to create a new theory of language to answer his question? for his theory does not change the calculation, which can be made by the other supposed theories of the universe. In his, as in many others, I find two principles—the names only are changed; but they are always the attraction and the repulsion, and between both the *inertia* of matter, which is instantly ready to obey the strongest impulse. And there I find the plain principle of all motion whatever, from the atom to the billiard ball, and from this to the sun, which is the centre of a system, but not that of the universe. The exhalation and the absorption, of the new theory, appear to me to be an effect, and not a cause in nature. I may be wrong; if so, I wish for an explanation from "E. A. M." in plain language, for I am a mechanic, and in exact terms, for I am a mathematician.

R. C.

October 26, 1840.

[We beg to inform our correspondent that he is mistaken as to the *sex* of his opponent. Ed. M. M.]

THE ASTEROIDS OF NOVEMBER.

Sir,—As the season for the periodical appearance of the November meteors approaches, permit me to urge on such of your scientific readers, whose love of the science of meteorology will compensate them for the fatigue of foregoing three or four hours of their accustomed repose, on the nights of the 12th and 13th of this month—the utility of making accurate observations on the most brilliant of them, noticing their apparent

place in the Heavens in which they disappear, and the precise moment of such occurrence. If simultaneous observations of any meteor were made at different stations, the real distance of such luminous body above the surface of the earth, could be readily ascertained, by the solution of one oblique triangle, in which the distance between each observer, with two angles are known, to find one of the other sides, which gives the horizontal distance of the meteor from one station: and its perpendicular height may be found by the solution of one right-angled triangle, where one side and its adjacent angle form the given parts. The observer should endeavour to take the *azimuth*, and *altitude* of the spot where they *disappear*, noticing also the mean time with as much accuracy as the circumstances will admit of with their *apparent direction* in the visible Heavens.

Should any young meteorologist feel disposed to make the observation specified above, and would be kind enough to favour me with a copy of the same, I should feel much obliged, and with your permission, should they prove available for the solution of the problem acquaint them with the results through the medium of your excellent Magazine.

Should you think the above remarks not derogatory to the usual topics of your useful periodical, by their insertion in your next week's publication, you would greatly oblige,

Your humble, and respectful servant,

J. T. GODDARD.

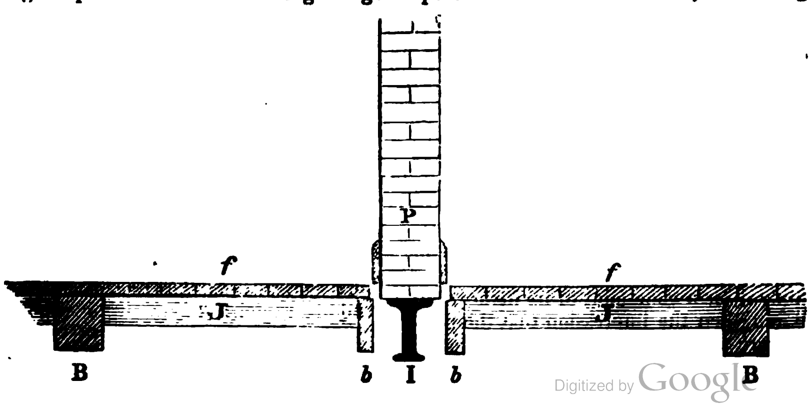
2, Clare-street, Bristol, Nov. 2, 1840.

P. S. Correspondents would please to state their latitude and longitude.

IMPROVED METHOD OF HOUSE BUILDING.

Sir,—The rapidity with which fires spread in houses where the sub-divisions are made by framed partitions covered by lath and plaster, makes it very desirable that some mode of constructing fireproof partitions should be more generally resorted to. Brick or stone partitions are obvious substitutes, but when sub-divisions on one floor occur, over voids in the floor below, their weight is a serious obstacle, as even when expensive trussed beams are employed to support them, they are still found to sink, and the ceilings under them soon begin to show cracks.

Having been led to think that this yielding of the trussed beams and sinking of partitions was not owing altogether to their absolute weight, but was rather caused by the constant vibration of the floors from the movements of the occupants, and having accidentally noticed some years ago in one of the new hospitals here a case of a stone partition between two chambers, which passed over the middle of a large room below, and having observed that from the way the floor was supported it would have very little action on the trussed beam supporting the partition, I resolved on following out the same principle in a house I was then about to have built for my own use, and in erecting it I caused all the partitions which were not over bearing walls coming up from the foundation, to be supported on cast iron beams, and along



each side of such iron beams, a half beam of wood being laid with a clear interval of an inch between them and the flanch of the iron beam, so that no motion could be communicated from them to the partition.

This construction appears to afford all the advantages I anticipated, as no shrinking is discoverable, although one of the partitions is made to carry a flight of a geometrical stone staircase to the attic story.

The main advantage I proposed to myself in this, was the attainment of security against the quick spread of fire, but I find the benefit of the non-transmission of sound, and of doing away all harbour for vermin, is sufficient to induce any one wishing to have a comfortable house, to follow the same construction, which is fortunately by no means an expensive one.

K. H.

Description of the Engraving.

P is the brick partition; B B, the beams, and *b b*, half beams; I, a cast-iron beam; *f f*, is the floor; J J, the joists.

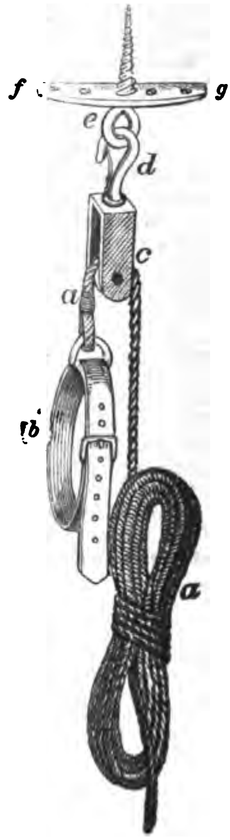
MERRYWEATHER'S DOMESTIC FIRE-ESCAPE.

"We cannot withhold the suggestion that more than one of the machines intended for domestic use only, to be resorted to by inmates of houses in case of fire, might be introduced at a trifling cost into houses with great advantage; especially in neighbourhoods not immediately within the reach of more public appliances."—*Messrs. Harvey and Braidwood's Report.*

Sir,—While the gentlemen quoted above were investigating the fitness of various public fire-escapes calculated for external application, they seem to have been very strongly impressed with the notion that it was the bounden duty of housekeepers, each to provide for the safety of his own establishment. "When it is known," say they, "that easy means of descent from the loftiest apartments of a house may be permanently obtained at a cost considerably under 60*s*., *an obligation is imposed upon the heads of families*, which, to disregard, would not only disarm complaint of its justice, but strengthen the impression that the public are too prone to reply upon external agency, and to throw aside the precautions of individual prudence."

A correspondent in a daily journal expresses a desire to be made acquainted with some one of these machines, which, at a trifling cost, would ensure the requisite protection. In order to supply this information, and remedy a deficiency which has been complained of by more than one individual, I beg to hand you a description of the following apparatus, which is peculiarly adapted for the purpose stated.

Merryweather's portable fire-escape ladders* are recommended for general adoption in the city, and the safety belt, rope, and pulley, detached from these ladders, *forms the best and simplest domestic fire-escape that can be employed.*



This apparatus is shown in the accompanying sketch: *a* is a strong rope, its

* Described in Vol. xxvi. page 450.

length being equal to twice the height of the building in which it is to be used; *b* is a broad leather belt and buckle; the rope *a* passes over a small brass pulley *c* attached to a snatch-hook *d*, and this forms the whole of the apparatus. This fire-escape may be stowed away in a window seat, in a small box or bag under the bed, or in a cupboard. It is, of course, necessary to make some suitable provision for hanging it up to, for use; this is conveniently done by fixing an iron ring *e* to a beam over the window, by the taper screw, still further secured by four wood screws in the ears *f g*.

In the event of fire, the escape is to be hooked on to the ring above, and the rope cast free into the street; the belt being buckled round the waist of any person, he is to be put out of the window and lowered, his descent being regulated by those below holding on to the rope. The person lowered may, if he pleases, keep a check upon the rope himself, by passing it through his hands. Where it happens that there is no trustworthy bearing above the window, the ring may be affixed to the floor, in which case, from both ropes running upon the window ledge, so much friction will be generated that a female might easily lower herself in perfect safety, without any extraneous aid. Increased friction is sometimes produced by the introduction of a second pulley close under the first.

Domestic fire-escapes of this description have already been pretty extensively adopted. The Chapter Coffee-house in the city, is fitted with them both back and front, and there are several others in the same locality, provided immediately after the melancholy fire in Ivy-lane. In a case or two that has come to my knowledge, the second and third floor windows, back and front, have been provided with ring staples, and the rope and belt deposited in a marked cupboard in one of the landings. This, however, is a very objectionable arrangement; for, in case of fire, it is about ten chances to one, that all access to the staircase is completely cut off by the ascending smoke, &c., in which case the escape is unattainable. The better plan is, to fix the escape on the highest floor where any person sleeps, because it is perfectly available from that point to all the lower floors.

Cradles, and bags of various kinds, have from time to time been recommended, as useful appendages to a fire-escape; I have found from considerable experience, however, that *the belt* is infinitely superior to every other contrivance; it is safer, and much more expeditious in its application.

From the strange and unaccountable plan of procedure, which the city authorities have chosen to adopt—from the recklessness of consequences which they have exhibited, it becomes more needful than ever for heads of families to make some provision for self-preservation.

With the simple apparatus I have here described, and a small rattle, fatal consequences could hardly accrue: the rattle is sure to obtain the instant attendance of the police, who would give every possible assistance to effect the rescue of those who might be endangered, which this escape would enable them promptly and safely to accomplish.

By a trifling outlay once incurred, future safety may thus be effectually secured, and the public cease to be the victims of civic procrastination, or the dupes of designing men.

I remain, Sir, yours respectfully,

Wm. Baddeley.

London, November 29, 1840.

CITY FIRE-ESCAPES.

On Thursday, the 29th ultimo, at a Court of Common Council, Alderman Thomas Wood brought up a report from the Police Committee on the subject of fire-escapes. After a short preliminary review of their proceedings, the committee submitted the report of Messrs. Harvey and Braidwood,* and noticed their recommendations in detail, concluding with the following remark:—"We, your committee, agreeing with the principle of the said report, beg to recommend to your honourable Court to refer it back to your committee, to carry into effect so much thereof as may from time to time be found necessary." Alderman T. Wood then moved that the report should be agreed to; Mr. Hicks seconded that motion. A discussion then followed, in which Mr. King remarked that any sum of money would be well bestowed in the endeavour to establish protection or escape.—Mr. Taylor admitted

* Inserted at page 427.

the propriety of what Mr. King said, but he did not see why a larger sum than was necessary should be expended. In cases of this kind, which appealed to all hearts, it was no difficult matter for selfish people to carve out what would answer their own purposes.—Mr. R. L. Jones said, that a great deal of credit was due to the committee; but he thought it would be proper to call their attention to the necessity there would be for some place in which to keep the machines. Now in his ward, a great difficulty had occurred as to the parish ladders: they were first kept in the churchyard, but when a fire broke out they were not to be had; they were afterwards placed against the wall of Whitecross-street Prison, but the prison keeper complained that the inmates would find some use for them. They were, in fact, like a parish pump—all the neighbours delighted in the acquisition, but not one wished it to be at his door. He trusted this difficulty would be looked to.—Alderman T. Wood said, that the difficulties which must necessarily attend the measures recommended by the committee had not escaped their consideration; they had, therefore, resolved to proceed step by step. It appeared to them advisable to place the machines in the custody of a person regularly [query *specially*] appointed; and it was their intention to commence operations with three or four machines, as the report indicated; and perhaps it would be found, when the arrangements were complete, that half-a-dozen would be sufficient. The committee would take care to guard against the possibility of a profuse or unnecessary expenditure, by not letting a shilling of the money out of their own hands. As the Society of Arts had been alluded to, he thought it proper to notice the great kindness with which their deputation had been received, and the pains taken by the authorities there to exhibit the models which they possessed. These models, however, were complicated, and indeed impracticable, compared with those of recent invention; and even the latter, the committee would have to improve, by a combination of different excellencies perceived in the designs exhibited in detail. After all, the thing was merely experimental, and the committee would act with all desirable caution.

The report was then unanimously agreed to.

It has been observed, that "in the multitude of counsellors there is safety," but that remark applies as rarely to the collective wisdom east as west of Temple Bar. We have here a subject, most truly described by one of their body (Mr. Lott) as "of the most vital nature—one that could not brook delay;" and yet we find those entrusted with the execution of the business, proceeding "step by step"—acting with "all desirable caution"—beginning with "three or four machines"—and expecting to find at last "that half-a-dozen" will be quite sufficient. And this, too, in the very face of a report, with the principles of which they profess their agreement; wherein it is expressly stated that less than *twenty* sets of portable ladders, and *ten* sets of a larger description, *will in actual use prove unavailing!* An authority of no small weight on this subject (Mr. Baddeley*) ventures to doubt the sufficiency of even this arrangement, and expresses a conviction "that less than *sixty* fire-escapes will not be sufficient to ensure the complete protection of the citizens;" and also shows at how trifling an expense this highly efficient protection could be obtained.

Thus, after four months industrious application to the investigation of the subject, assisted in their enquiries by the City Police Commissioner and the Superintendent of the London Fire Establishment—after examining 44 designs for a fire-escape, besides making a useless pilgrimage to the Adelphi, the Police Committee declare that the matter they are about to proceed with is—MERELY EXPERIMENTAL! Gracious heavens. *An experiment!* between the £ *s. d.* of the Corporation on the one hand, and *the lives of their fellow-citizens* on the other. Can such things be? And these are the men, forsooth, who are going to "*improve*" the excellent designs submitted to their inspection "by a combination of the different excellencies perceived in the designs exhibited in detail!"

"Another fatal fire in the city" will shortly be the cry, and then let the authorities be overwhelmed with shame at their tardiness to avail themselves of the practical skill and experience offered for their adoption, and stand self-convicted of withholding in a mercenary spirit the paltry sum by which such a calamity could have been prevented.

* Vide page 436 of our last Number.

APPARATUS FOR REGULATING THE DRAFT OF LOCOMOTIVE ENGINES.

Fig.2.

Fig. 3.

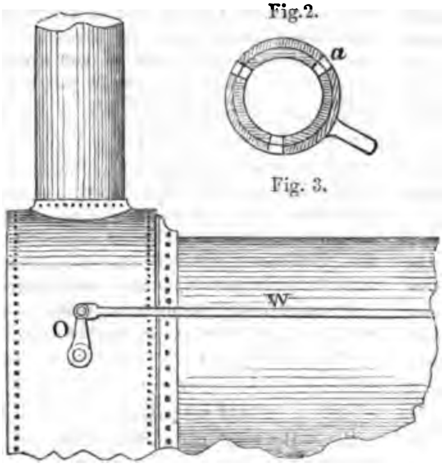
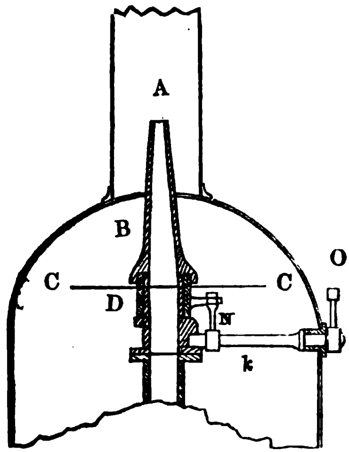


Fig. 1.



Sir,—In consequence of the powerful draft required in the furnace of a locomotive engine, it has been found necessary to contract the orifice of the waste steam pipe, which projects up the chimney. The contraction of this orifice, although absolutely necessary to cause a sufficient draft, has been carried to so great an extent as to reduce in a great measure the power of the engine.

There are undoubtedly occasions, and very frequently too, when not so great a draft is required; therefore a contrivance capable of increasing or diminishing the size of the orifice, and consequently the quantity of steam forced through it, is necessary. This may be accomplished by the following method, which suggested itself to me a few days ago, and which I think will be simple and effective. I trust you will not for a moment suppose that I pretend to be the first inventor of a blast regulator, (if I may be allowed to give it a name,) but as far as my information extends, the following is different from, and simpler than any contrivance hitherto made use of for the same purpose.

A, fig. 1, is a section of the waste steam or blast pipe; B is the contracted orifice through which the steam is forced, after it has worked the piston; D, is a hoop, or ring, about 5 inches long, adapted to the outside of the pipe A, so as to work easily round it. This hoop has three oblong apertures in its side corresponding with three in the pipe A, as shown at fig. 2, which is a section through the line C C; *k* is a spindle furnished with two levers N O. The lever N is connected by a moveable joint to the projecting arm of the hoop D. To the lever O, which projects a little beyond the side of the smoke box, is attached the rod W; fig. 3, which runs along the side of the boiler, and is under the immediate control of the engine man.

By attention to the figures, it will be seen that the moving of the rod W, will cause the hoop D to move round the pipe A, and consequently, open or shut the apertures *a a a*. By this means the steam, instead of being forced through the narrow orifice B, may be allowed to escape through the apertures *a a a*, which may be opened and shut at pleasure.

The principal intention of this contrivance is not to regulate the draft, but to allow the steam, when the draft will admit it, to escape more freely from the cylinder, after it has worked the piston, which will add very considerably to the power of the engine.

I am, Sir, yours respectfully,

JOHN C. PEARCE.

Leeds, October 15, 1840.

IMPROVEMENT IN OMNIBUSES.

Sir,—An idea having struck me, which might, I think, be useful, I should be obliged by its insertion in your valuable journal. It is a contrivance for facilitating the transit of passengers in omnibuses, and is this:—To elevate a platform of about 3 or 4 inches high and as broad as could be conveniently made, along the floor of the omnibus. As it would be supported by pillars placed at convenient distances, those sitting would have the same room for their feet as at present.

If the height of the omnibus was insufficient, an elevation of a corresponding breadth might be made in the roof; the sides of this elevation being fitted with revolving blinds would furnish an excellent system of ventilation.

I am, Sir, yours, &c.

A. H. P.

Somers Town, October 27, 1840.

SYMINGTON'S CONDENSATION.

Sir,—Though I think there is room for much reasoning in favour of this system in answer to Mr. Fox, short facts are perhaps the best replies to long "impossibilities." I beg, therefore, to inform this gentleman, that this plan was applied four years ago to the *Dragon* steam tug of 80 horse power at the risk of the patentee, who was not to be paid for it unless the proprietors were satisfied. It *was* approved of and has since been, and still is in constant operation on the Thames. During these four years the proprietors have been at no expense for the boilers, and Mr. Jeffrey, of 18, Burr-street, Wapping, will, no doubt, confirm on application, what he told me a few weeks ago, that whilst another boat of less power (35 horse power) belonging to the same parties (since sold) had cost 200*l.* for repairs owing to encrustation, the *Dragon* had cost nothing for such repairs, though both boilers were supplied at the same time, and both tugs equally employed in the same business. About 18 months ago I was on board the *Dragon*, and saw Symington's plan tried for *two* "consecutive hours" without any mixture of external water; then the old plan was turned on, worked for two hours; and again, S.'s plan, and so on alternately until ten o'clock at night. I saw the coals weighed, and counted the revolutions, and carefully took down the results. There was a saving of fuel of more than a fourth with S.'s plan, though the usual injection commenced always on clear boilers, and one revolution more of the wheels in favour of the patent system was conclusive that the engines "worked up to their full power." Another tug, *Fletcher's Dispatch*," is now, I am told, in a satisfactory working order at Hull and Goole, but as I do not know this except from report, Mr. Oldham, who resides at the former place, and thinks so highly of Mr. Hall's, will perhaps be so good to ascertain the facts and oblige your readers.

I am, Sir, your humble servant,

DICK, TOM OR HARRY.

October 27, 1840.

On the same.

Sir,—By way of apology for again trespassing on your columns on this long subject (which, after so much indulgence, I do very unwillingly), I beg to refer to my communication in your 900th Number, wherein will be seen the incidental manner in which I was led to express an opinion of the superiority of Mr. Symington's system of condensation. Neither "R. S. M." nor "Honestometer" (in whose last, by the way, is a terrible mistake, and who will *not* see what is plain enough to two other writers) having continued their remarks to the contrary, I should not now renew the discussion, but for Mr. Fox's paper in your late number, who has taken up the question in a tone and manner, and with a strict adherence to the matter in hand, deserving of general adoption. I am therefore unwilling to let my opinion rest upon mere assertion, without endeavouring to support it by some show of reason, particularly after the decided inference that must arise from Mr. Fox's paper, that it is a silly fallacy. This gentleman (basing his decision upon Mr. Hall's experiments, which, in my opinion, are very inconclusive, and were not conducted with that talent which certainly belongs to him) asserts "that the doing of that which Mr. Symington and Mr. Howard propose *is totally impossible*," and then urges "one important matter which must *inevitably render their methods of condensation abortive*."

It seems to me that if Mr. Hall can cool down 13 gallons a minute from 225° to 60°, there is nothing *a priori* why Mr. Symington cannot reduce the temperature of 1200 gallons from only 100° to 60°—being in his favour, as regards temperature, so great a difference as 125°. Still less can I see anything in the experiments of Mr. Hall, and the trial on the *Londonderry*, to show the difficulty. Experience has taught me to pay little attention to *Certificates* if opposed to first laws, and experience has also taught me to place far less reliance upon reported failures, where the inventions have appeared to me based upon sound principles. Let us apply that experience to the systems of Mr. Hall and Mr. Symington. Mr. Fox tells us your correspondents have fallen into great errors respecting the former, but as he does not point them out, and as I believe that among scientific men, the fallacy of Mr. Hall's condensation is now pretty well admitted, notwithstanding the numerous certificates in its favour, I will pass to Mr. Symington's failure and Mr. Hall's experiments. Had Mr. Hall applied the surface mentioned by Mr. Fox, or somewhat more, to cool the injection water in the same minute division as Mr. Hall now finds indispensable for surface condensation, he would, I doubt not, have arrived at quite a different conclusion. The pipes were 7 inches in the experiment—they are half an inch only in the latter system! With pipes anything like 7, or even 4, or 3 inches diameter, the water would rush, in almost an undivided, undisturbed body, into the condenser; and although partaking in some degree of a double motion, the particles of water would not have time to change their position, to be reduced to the required temperature. The pipes in the *Londonderry* were, I am told, one of 4 inches diameter to each engine, running from the hot well by the keel to the bow, thence to the keel, and returning to the condenser. Had I been told such a pipe had performed proper condensation, I should have doubted the fact. Here the same cause was in operation, but had the water been minutely broken up by checks in this pipe, or had there been four pipes of 1 inch, instead of one of 4 inches, the effect must have been different; for it will be seen what an admirable condenser is the open sea or river, and with what rapidity every particle of heat would, with proper surface, be swept away by the speed of the vessel. It was a bold and original thought to get rid of force pumps and condensers, expense and loss of power, by placing the pipes in so perfect a cooling medium, and where, in my opinion, they are as safe as the keel, and being parallel to the vessel way, offer as little impediment as her sides.

I have passed over Mr. Howard's system, because Mr. Symington's is the one more particularly referred to as having failed, and I was desirous of being as brief as possible. That the latter is considered a failure by every steam shipping company I know; I do not hesitate to admit, and Mr. Fox has correctly stated, that it was found necessary to use a portion of the usual injection with the other. At the same time I am equally ready to maintain that it has got a bad name more from the manner of its introduction, and the bad taste in which it was sought to be thrust down the throat of one Company, than from intrinsic defects; and it stands a pretty good chance of being "for ever fallen," from what I can learn. I might here repeat a conversation with a talented Director on this subject that might not be useless to inventors, but as

————————"I protest
Against all evil speaking, even in jest,"

I content myself with this admission, that Mr. Fox has some reasons for considering it, as others do, a failure. I will, however, further venture to express an opinion, that when this plan shall become properly investigated and understood, it will be considered one of the most valuable adjuncts to the more general adoption of steam navigation for long voyages, than any improvement since the creation of this Material God, by the late Mr. Symington—that talented individual, who, with so many more before him, has suffered the pangs of unrequited genius; for in his brain was indisputably kindled that early spark which has since dawned into a clear and steady light, but which no longer astonishes the world, only because mankind, accustomed to the brilliancy of the inven-

tion, have lost their admiration and gratitude in its common enjoyment.*

It may, perhaps, save time, if at once I endeavour to remove those prejudices which, in conversation, I have heard urged against Symington's system. There are two: one that the pipes impede the vessel—the other, their exposure to injury; both erroneous, as a little consideration will render apparent. It was on the first ground that the pipes were removed from the *Londonderry*—not from any inability to offer sufficient cooling surface; but this, if I am correctly informed, is disproved by the fact of the vessel having performed six passages across the Bay of Biscay with more steam, with boiler free from encrustation (proving, by the way, how little sea-water could have been required), and failing to make her voyages when they were removed. Admitting that the pipes present somewhat more surface than the part they cover, and that, consequently, there *must* be more resistance, yet I think it is so minute as to be incapable of ascertainment; just as two charges of gunpowder fired by galvanic action through a wire of many hundred yards, one being at the commencement, *must* present *some* difference of time between the stroke and the discharge at either end, yet the eye takes them in so simultaneously, that the finest second hand cannot detect the variation, and no mental operation can determine it. Further, in regard to any obstruction to the speed, I would refer to *the Eclipse*. This vessel condenses throughout her length and breadth by the water passing over that space, entering at the bows and passing out at the stern, having, I believe, a double bottom. Here the water must be pent up, struggling to escape, and causing by its weight far more resistance than could occur with Symington's plan. Why the pipes are more liable to injury than the copper sheathing of the vessel, it would be difficult to find a satisfactory reason. A neat ship's carpenter would so fine them at all salient points by a protecting shield as to offer no practical resistance, and render them difficult to be got at, whether on the vessel grounding or otherwise. But if injured, the facility of resorting to the common injection, as mentioned by Mr. Fox, removes all objection on this point. There is one extra advantage, however, belonging to this plan which does not seem to have occurred to the inventor—at least it was not known in the *Londonderry;* it is this: that if the pipes be properly applied, then is removed that "*impossibility*" of Mr. Hall's [to mechanical science, *ce mot n'est pas Anglais*, Mr. Hall! if you will allow me to transpose Buonaparte's celebrated aphorism] "of regulating the quantity of injection water according to the speed of the engines, whereby great danger arises of choking the condenser and the air pump, and of even breaking down the engines, and of deducting greatly from the power of the engines," &c. Why—all this "*impossibility*," I repeat, is rendered possible. The engineer need not, at least so it seems to me, pay any attention to the injection water, which very beautifully is self regulating without the addition of a pump or any machinery whatever. And this simple principle, if I mistake not, will add something worth having, to the power of the engines. [Talking of increase of power, by the way, how *could* you, Mr. John Fox, in your celebrated letter to the Admiralty, tell them of an increase of power of one-fourth, besides a saving of one-fourth of fuel by the use of these said "perfect" condensers? Surely the *Queen's* directors would have applied them to the *President*, had they found the duty of the engines of the *Queen* raised from 500 horse-power to 750!

* To avoid being misunderstood, I allude to Mr. Symington as the practical not the ideal, inventor of steam navigation; the first who in this country had the courage to set about it, the energy to persevere, and the ingenuity to overcome every obstacle to its accomplishment; who was rewarded by the distinguished honour (alas only the honour!) of propelling the first really efficient steam boat of the world; and to whose triumphant success may clearly be traced the subsequent growth in America, and then, in this country, of this stupendous power. I must own I give little credence to the foggy story about Blasco de Garay, in 1543, and doubt that the Marquiss de Jouffroy's boat on the Soane in 1781, would have established, as did Symington's, the practicability of steam navigation. It would at the same time, be unjust not to award a very prescient genius to Jonathan Hulls, who (now a century and four years ago, did his genius so expand as even to contemplate such an extensive application of his thought!) modestly offered this palpable personification of the fabled Neptune of a darker age to an unbelieving generation in these prophetic words:—"The scheme I now offer to the world is practicable, and if encouraged will be useful, and I hope, that through the blessing of God it may prove serviceable to my country."

This obtuseness on the part of the correspondents of the *Mechanics' Magazine* —their inability to discover it—may be one of those "great errors they have run into."]

In taking leave of this subject (unless called upon for explanation,) permit me to remark, in conclusion, why I prefer Symington's system of condensation to all others. I will first assume there is no real "*impossibility*"—that as Mr. Hall does reduce the steam which produces the 13 gallons of water to the temperature of injection water, Mr. Symington can do so likewise. In both cases this same quantity of caloric has to be taken from the same quantity of steam, (a little in favour of S., because some water is returned from the hot well to the boiler,) and this Mr. Hall effects entirely by surface, whilst Mr. Symington does it first by injection, then by cooling that injection. Whether the last plan is "impossible" (as Mr. Fox states,) under a judicious application of means can alone be determined by experiment. That Mr. Howard *has done it effectually* he has positively stated, and this, in my opinion, was under less favourable circumstances than the external condensing of Symington. Setting aside the inconclusive experiments referred to by Mr. Fox, (supposing, for instance, Mr. Hall had with precisely the same means tried surface condensation, what *then* would have been the result, and would any reasonable man consider it conclusive?) I am entitled to assume that the thing can be done and done well. Now I judge of every invention not more by what it effects than by its means of accomplishment. Symington's unites more than any other plan I am acquainted with, the criterion of useful invention stated in my second paper in your No,* simplicity in the means, and efficiency in the end. Any thing more simple cannot be. A few pipes is all the invention. Nature does the rest. Evils of so great magnitude, removed by means so simple are the evidences of its excellence. On this account it must be far cheaper in its first cost than others. Little labour can be needed in its application, and as no contraction or expansion can occur, few joints are required, and these the admirable "autogenous soldering" would probably render unnecessary, or nearly so. Thus, durability and little liability to get out of order from imperfect joints, are insured, for these are the conditions of simplicity. No force pumps are required, and no lumbering condensers—the open sea having given one to the inventor as perfect as eternal. The plan relieves the engineer from all attention to the injection, which regulates itself with the ease and unchangeable obedience of Nature's laws to the wants of the engine. Should the pipes be broken, the very accident causes their old plan to start into simultaneous action. Well-regulated companies sight the bottom of their steamers every six months, giving sufficient opportunity for inspection, though when the pipes are injured, I would rather not be in the vessel, for it must be of that serious nature as would at the same time place her in considerable peril.

If you think these observations for the faith that is in me are equally entitled to consideration, as the experiments referred to by Mr. Fox in evidence of the "impossibility" of Howard's and Symington's plans, and if not tired of the subject, you will perhaps find space for this paper, which may thus introduce into notice (like Mrs. Johnson's soothing syrup) "a *real* blessing" to the steam navigation world.

I am, Sir, your obedient servant,

SCALPEL.

October 26, 1840.

Postscript.—Overwhelmed as you seem to be with communications, I am reluctant to add my paper sent you this week, but as the condensation question appears to have attracted some little attention, you will, perhaps, let me correct, through your pages, an error or rather misconception, of the injection plans which the writer of "Notices of Steam Navigation," has fallen into in the *United Service Journal* for the present month. Before doing this I would observe, in reference to Hall's condensation which is there commented on, that no where will the writer find anything to support his observation that—"it appears to be admitted by all *unprejudiced* persons that the condensation by surface is (at least) as sudden and complete as by injection." The direct contrary is the

* I heard it stated that "Scalpel" had committed an error in this paper in the number of horses power required for the air pump. I take this opportunity of correcting it. Instead of 46, it should be 20. On data being given, it was so evident that it was a mistake of figures, not of principles, that I considered it needless to trouble you for an insertion. I omitted to halve the strokes of the air pump.

fact. I must also protest against the singular assertion, that, "Mr. Watt laid aside condensation by surface in favour of injection, not from any excellence inherent in that principle, but from the thickness of metal of which the globe is composed." Why not then try their metal? would occur to the least inquiring mind. Can we conceive it possible that Mr. Watt should continue attempts so unphilosophical that a tyro would be ashamed to adopt; or that he would lay aside a system because, with means he must have known were inadequate, he found the result so unsatisfactory. Even were it not well established that Mr. Watt had used thin copper tubular condensers, it would savour more of a proper appreciation of his judgment to infer that the same process of mind which had invented separate condensation, and those experiments which had correctly proportioned the injection matter to effect it, would have led to the proper application of the same quantity of cold by surface. Satisfied, as all acquainted with the steam-engine must be, of the superiority of surface condensation, *per se*, but that its preponderating drawbacks prevent its general application, we can only reasonably conceive that Mr. Watt was equally well informed on the subject as ourselves, and had tried every means which his great talents would suggest to remove them, but that he relinquished this system because he found, taking all things into consideration, the superior "excellence inherent in injection," namely, its cheapness in first cost, the little expense of keeping in repair, and little liability to derangement compared with the thousands of joints of surface, its perfect simplicity, its precision, and instantaneous action. To assert otherwise is but a gratuitous assumption unsupported by authority or reason; for, however little may be the reliance placed by some on the speculations of philosophical induction, in the absence of facts to the contrary, it is the only sure light, and one, properly used, of far spreading rays to guide us in our researches into the past, and we shall at least err on the just and least doubtful side, when our inferences render consistent and harmonious the characteristic excellence of the genius of the dead. No writer, who voluntarily takes upon himself to instruct the public, should approach so sacred a deposit as the fame of great men, without a minute acquaintance with their works, and a complete knowledge of the strength and peculiar property of their minds. Then should we no longer see dancing, like motes in the sun-beams, those thousand and one floating assumptions to their prejudice, which being investigated "like the baseless fabric of a vision, leaves not a wreck behind." But in an age of a forced and fleeting literature, the wants of the passing hour are unfortunately supplied at the expense of accuracy, and the fabled labours of Hercules would be an easy task compared with that of rectifying the many evils it is producing. But to return to the chief object of this postcript. After noticing, without the praise it deserves, Howard's plan of condensation, and referring to Symington's as "not yet having been made public," though three years ago it was publicly applied to the *Londonderry*, the writer concludes with these words, aiming, apparently, a fatal blow at condensation by injection,—"There is one point connected with the principle of condensing the steam by an injection of purified water, which strikes us as not having been as yet fully considered, which is that the water resulting from the condensation of the steam would be altogether insufficient in quantity to effect that object; and therefore it appears to us that the supply of the condensing jet must, sooner or later, have to depend upon the quantity of pure water with which the condensing cistern was originally supplied. *It can hardly be contended that a cubic inch of water would be sufficient for the condensation of a cubic foot of steam, and also to supply the waste of evaporation, leakage, &c.*" And here this objection, if fatal, would apply with still more reason to Symington's plan, because there is no condensing cistern attached to it; nothing but the mere pipes which lead from the hot-well and terminate in the usual condenser. Yet being full at starting, is the simpler answer. The quantity can never be diminished so long as the engine is at work, the steam from the boiler, when condensed, keeping up the exact proportion required, because the pipes can only be full, the rest supplying the boiler in the usual way. It it for such reasons as these that I prefer this plan. Once the pipes are properly applied the plan requires no further looking to. Though the chances of "leakage" in pipes that can be fused into lengths, almost jointless, are compared with surfaces, as units to thousands; yet, if leaky, the lighter distilled water, flowing to a vacuum, would be prevented escaping by the denser sea water, and as every stroke would continue the proper quantity in the pipes, (just as much as they could hold,) but little external water could find admission, not sufficient in a month's constant work to encrust the boilers. But with surface, no sooner would the joints leak (and can the writer in the *United Service Journal* suppose there is no liability to "leakage" in fourteen thousand,) those not being filled, the external water would rush into the vacuum at every stroke.

31st October, 1840.

RECENT AMERICAN PATENTS.

[Selections from Dr. Jones's List in the Journal of the Franklin Institute, for August, 1840.]

Carriage Brake, *C. Walker, July* 8. This brake is to operate by forcing a friction bar against the hind wheels of a carriage, the foot of the driver being placed upon a treadle for that purpose. The affair does not present a large amount of novelty, but it differs from other brakes in the particular arrangement of the rods and levers, and this constitutes what is claimed.

Cutting Shingles, &c., *J. Burt and E. Smith, July* 9, 1839. The claim is to "the manner in which we have constructed and combined the parts by which the stuff to be cut is fed up to the knife, and canted so as to produce shingles of the proper slope;" which method is particularized, but is much too complex for verbal description. It is managed with much ingenuity, and will probably operate well. The shingles, &c., are to be cut from steamed timber.

Elliptical Steel Carriage Springs, *F. Hatch and J. W. Terry, July* 10, 1839. Two bow springs are jointed together at their ends, so as to form the ordinary (so called) elliptical spring, and within these two, other bow springs are placed, with their convex sides towards each other; these are joined together at their middles, whilst their ends bear against the interior of the first-named springs.

"What we claim as our invention, and desire to secure by letters patent, is the addition of two leaves to the inside of the elliptic spring, with the curves reversed, in the manner herein described."

Planing Machine, *F. Walcott, July* 16, 1839. This planing machine is in its general mode of operation like that of the late Mr. Woodworth, but the cutters are double ironed, and the claim is to "the combination of the double iron rotary plane with the throat, or mouth-piece, constructed and operating as described."

Clearing Railroad Tracks from Ice, &c., *J. N. Dennison and E. Kirkpatrick, July* 29, 1839. The plan for clearing off ice and snow from rails, consists in affixing scrapers and revolving brushes on the fore end of a locomotive. The scrapers are to be placed obliquely, so as to throw the ice or snow outwards, and they are fixed in spring bearings, so as to admit of their yielding when necessary. The brushes are made to revolve just back of the scrapers, and are intended to remove the snow or ice left by the scrapers. The claim is to this arrangement, which we apprehend will, in most cases, be so inefficient as to cause it soon to go out of, if ever it has been in, use.

Anti-friction Apparatus, *J. G. Tibbets, July* 22, 1839. This is said to be "a new and useful mode of applying rollers around axles, and balls at the ends and shoulders thereof, for reducing friction." The patentee says that he does not claim "the employment of rollers and balls to avoid friction in machinery, but what I do claim is the combination of the two sets of concave flanches with the balls working between them, to prevent the balls from rubbing against the axle and box, in the manner, and for the purpose set forth; and also the reducing the diameter of the rollers at the middle, to form a space for oil."

When we hear, satisfactorily, of the benefits derived from this apparatus, we will give to our readers the matter entire, with all its illustrations. We are very apprehensive, however, that the day is far distant when we shall be called upon to redeem this promise.

Obtaining the Rectangle of any Irregular Figure, *T. Wood, July* 22, 1839. The claim under this patent is to "the application of the principle, that 'solids introduced into fluids displace a quantity equal to their bulk,' to the mensuration of superficies by means of mercury and glass plates, as described." And the patentee says, "the nature of my invention consists in cutting paper to a corresponding form and dimensions with an accurate plot of the superficies to be measured, and introducing it into a stratum of mercury between glass plates."

The mode pointed out of obtaining the rectangle of an irregular figure is about as useful and as accurate as some *mechanical* modes which have been proposed for obtaining the quadrature of the circle. It goes upon the principle, that by ascertaining the quantity of mercury displaced by a rectangular piece of paper, similar to that from which the form of the plot is cut, the quantity displaced by the latter will give the elements of its rectangle, however irregular its outline may be. Who will buy a right?

Metallic Hubs for Carriages, *G. Hunt, July* 8, 1839. The claim under this patent is to "the mode of securing the pipe-box of the hub to the arm of the axletree, by means of a band attached to the flanch of the axletree, embracing the flanch on the pipe-box as described."

On the inner end of the box there is a projecting flanch or rim, which comes nearly into contact with the shoulder, on the head of the axle. The band mentioned in the claim is fastened to the head of the axle by a screw bolt; and a flanch, or fillet, on the interior of this band, embraces the shoulder on the box, and holds it in place, leaving it free to revolve.

Padlocks, and Locks of other kinds, *J. Nock, July* 16, 1839. The objects professed to be attained in the construction of these locks, are to secure them from the dan-

ger of being opened by a false key, and also of being opened by a blow, given either by accident or design, by which the bolt or catch of an ordinary padlock is frequently started, and the lock opened.

There is to be a notch on each side of the bow of a padlock, to which are adapted two catches on what is called an escapement tumbler, and when this tumbler is acted upon by the key, it must be carried to an exact point to allow the bow to be liberated, as otherwise it will be held by one or other of the catches. In other locks the same device may be used, by arranging the parts so as to adapt them to the particular kind to which they are applied. These padlocks are now employed on some of the United States mail routes, and are to be adopted for the whole as soon as the supply is sufficient.

HAMMERS AND HATCHETS, *P. Eastman, July* 17. The eye of the hammer, or hatchet, is to be oval at one end, and round at the other, the round side being that at which the handle is to enter. This hole or eye is to be tapped in the round part, to receive an iron socket, which is to be screwed into it, and to pass through sufficiently far to occupy a portion of the oval part of the eye; an oval punch is then to be driven in at this end so as to open the socket to the eye, and prevent its turning. After this, a wooden handle is to be passed through the socket, and wedged in the ordinary way, to open it to the oval of the end of the eye.

The claim is to the "making the socket with a screw on the outside thereof, to screw into the aperture or female screw for the same, and extending it into the oval part of the aperture in the hammer a short distance, where it is made to assume a corresponding oval shape, by punching or otherwise, to prevent turning or drawing."

DRILLING IRON, BRASS, &c., *J. H. Currier and W. H. Taber, July* 8, 1839. A mandrel carrying the drill, works in collars within which it can slide back and forth horizontally. A lever of the first kind is attached to an upright rising from the bore of the machine, the lower end of which is received between two collars on the mandrel, so that by the motion of the lever the mandrel may be moved in either direction. A screw passes through the upper end of the lever, and is tapped into the upright, but not into the lever, within which it turns freely, having a shoulder that bears against it. There is a hand wheel on the head of this screw, by which it may be turned, and a winch on the back end of the mandrel, by which it also may be made to revolve. This constitutes the whole machine, which may be affixed to a bench or held in a vice.

The claim is to "the method of forcing in and drawing out the drill stock, lever, and screw, in the manner described." There is, we suppose, sufficient novelty in this arrangement, but we do not think the plan an improvement on several other machines which we have seen in operation.

LAMPS FOR BURNING SPIRITS, *J. S. Tough, July* 17, 1839. "This improvement consists in raising the horizontal plate at the mouth of the shade for increasing or diminishing the draft, by means of a metallic frame or screw, instead of raising or lowering the shade or wick," and the claim is to this, and to the particular manner in which it is effected.

NOTES AND NOTICES.

Development of Odours.—Every one is acquainted with the rotation which a piece of camphor undergoes in water, and the explanation of the fact which usually ascribes it to the disengagement of the odorant vapours which exhale from it. It is known also that the leaves of the *schinus molle* placed on water, forcibly retract when the surface of the water is covered by a layer of odoriferous oil. M. Morren has just observed a similar phenomenon produced by the volatile oil secreted by the down of the *passiflora fœtida*. When some of the down or hair is placed under water, a small drop of green oil detaches from it, and swims on the water. This drop expands, contracts, expands, contracts again, then seems to burst with force, but the fragments unite to expand again a moment after, and thus the action goes on for about ten minutes, after which the oil is by degrees concentrated, and becomes motionless. These facts may serve, perhaps, to point out a physical theory of odours.—*Jour. de Pharm.*

Durability of Leather.—Visitors to the Hospital of St. Cross, near Winchester, are shown in the hall two leather stoups or black-jacks for ale, which are, upon pretty good authority, stated to be three hundred years old. Perhaps a more striking proof could hardly be advanced that there really is, for durability, "*nothing like leather!*"

Tuck's Hermetic Envelopes.—An ingenious plan has lately been adopted, by which the penny postage labels may be used as wafers to letters. The difficulty that formerly existed in doing this, consisted in the fact that if the address was on one side of the letter and the label on the other, the latter was apt to be overlooked at the Post-office, and the letter charged double postage. This difficulty is now obviated by the new plan referred to, as the address is written on the same side as the seal, thus securing that both will be attended to by the Post-office functionaries.—*Examiner.*

Cloth Manufacture, Booth's process.—Sir,—In the Freemason's Magazine, for March, 1797, the death of Mr. Samuel Booth, of Cumberland Gardens, Vauxhall, was announced—stating that he was the inventor of the polygraphic art and of the more important *art of manufacturing cloth by a perfectly original process.* I shall feel obliged if any of your readers can inform me what was the process performed by Mr. Booth for manufacturing cloth.

October 15, 1840. C. C. C. C.

A Steam Fire-engine has been invented at New York, by Captain Erichsen. It weighs only 2¼ tons, and will throw 3,000 pounds of water per minute to a height of 105 feet, through a nozzle of 1½ inch diameter.—*Times.*

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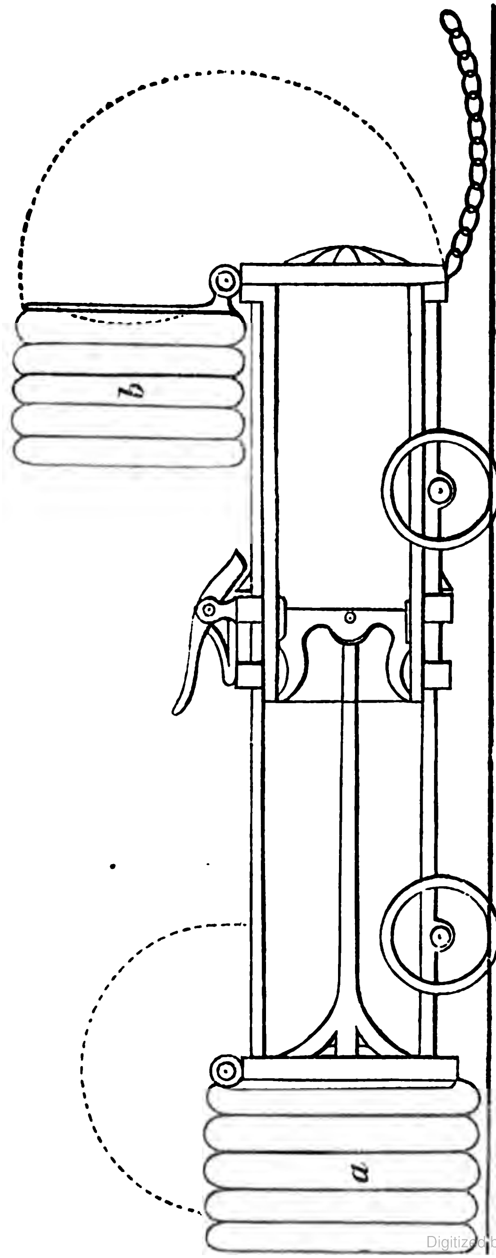


SIR GEORGE CAYLEY'S GENERAL BUFFER FOR EACH END OF RAILWAY TRAINS.

ESSAY ON THE MEANS OF PROMOTING SAFETY IN RAILWAY CARRIAGES. BY SIR GEORGE CAYLEY, BART.

The enormous advantage of railway communication is now fully appreciated by all classes of society; and even the chariot and four is laid aside, or, disengaged from its proud steeds, hoisted on the sturdy back of its rival, to grace the more plebeian vehicle by the fascinating halo of its coronet. Our delight in railway speed is unfortunately chilled by the accompanying drawback of its danger. Within the last three months many serious accidents destructive of life, under very awful circumstances have occurred; and though on comparing the millions of persons who have availed themselves of the benefit of railroad travelling without injury, with the few that have suffered, there is reason to believe that a greater per centage of fatal accidents prevails, mile for mile, in carriages drawn by horses; yet as it is now evident that the former will eventually extinguish the use of horses except for local purposes, it becomes the duty of the legislature to apply the best means in its power to insure safety of life and limb to her Majesty's liege subjects of all ranks; and not to leave them exposed merely to such measures of care, as the directors or agents of railroads may choose, when enjoying, danger or no, a complete monopoly of the public means of conveyance. No doubt, were railroads to be constructed now, with all the knowledge gained from the experience of the past, much additional safety might be attained. Supposing, for instance, that instead of making the wheels, as at present, sink about an inch and a half by the side of the rails on which they run, they had three inches of hold before they could be lifted out, many small substances that would now throw them off would not have that power; and probably the cases of accident from that source would be diminished one-half. Many other similar improvements experience must have pointed out; and it would be very useful to draw all this experience to a focus by a parliamentary committee of enquiry, not only as respects the construction of the machinery of railroads, but as to the best code of precautionary measures of management;—the sufficiency, as to the numbers and quality of officers—the arrangement of signals—and all the various manipulations required to give the greatest possible safety in combination with the required velocity of the trains. Such a committee might go still further, and by calling upon our first-rate engineers, and other scientific persons, to suggest such improvements as they think attainable, much expedite the ordinary progress of this new art to maturity. With a view to stimulate the legislature to go into this enquiry, it may be well to consider some of the leading points of danger, and to suggest such means of counteraction as may be most obviously applicable to each case;—more in the expectation that these or similar means may be matured by the proper authorities in mechanical science, than as worthy of application in the crude state in which they are thus pointed out.

It is obvious that the danger of being conveyed with great velocity, arises from the possibility of that velocity being too suddenly stopped; and before we can judge of the efficacy of a remedy for this evil, it is necessary to have a knowledge of the degree in which it prevails.

Twenty miles per hour, including stops—say twenty-one actual velocity—is about an average speed on most railroads. Were this suddenly stopped, as against the abutment of a bridge, &c., the blow would be equivalent (without buffers and cushions) to falling from a height of sixteen feet upon deal boards,—if happily they escape a more severe contusion from some protruding point, as the elbow of the opposite seat, or the scull of their vis-a-vis. This danger has a tolerable parallel in what might be expected, should the drawing-room floor give way, and precipitate its inmates on to that of the dining-room beneath. It is not necessary to add to our dislike of such a catastrophe, but yet it is useful to have a true measure of the degree of danger from this source; and it is sufficient to state the fact, that double the speed named, or forty-two miles per hour, is frequently attained in descending inclined portions of the way. In this case the blow would be equal to that received in falling from a height of about

sixty-four feet. This is falling from the chimney top to the cellar—an experiment not to be tried twice in one man's life time.

To meet this danger, every railroad carriage is provided with two buffers at each end of its frame; these are formed of leather caps well stuffed, and fixed on an iron shank, which presses on strong springs placed under the frame for that purpose. These springs can, when great force is applied, recede about a foot before the buffer can be pressed home to the frame. This is a very admirable contrivance, and perhaps the best that can be applied in each carriage separately. Suppose it may require a force of four tons to press home the two buffers, and that each loaded carriage be two tons weight, the power of resistance in the two buffers will be equal to what they would restore in their recoil, which would be equivalent to raising four tons half the length of the action of the spring, or six inches, and equal to two tons raised one foot. But the velocity of twenty-one miles per hour in the carriage is sufficient, if so applied, to raise its weight of two tons, sixteen feet; hence the buffers would only absorb an eighth part of the shock in the first carriage. This is, of course, but a rude approximation to the truth, through the means of an hypothetical case; but it may aid our ideas in seeking a remedy, and it points out that although the buffer cannot be dispensed with, yet that it does not carry out the principle of an elastic retarder to a sufficient extent.

It is obvious that to take full advantage of this principle, there should be in advance of the engine, and in the rear of the last carriage in every train, a separate vehicle devoted to carrying a buffer of sufficient power to save the whole train and its engine.

The first idea that naturally presents itself, and has probably done so to many, is that of making a series of mattresses, of some elastic matter, to be so packed on the frame of a carriage (say for twenty feet in length) as to be able to be compressed to any extent on meeting resistance; and I am by no means certain that any other contrivance will do much better; but in these engineering days we shall never be contented without some more precise and workmanlike method, and luckily the elasticity of air when compressed by a piston offers a ready means for effecting this purpose with such precision as to be subject to exact calculation, and of course capable of being adapted to the power required. The piston in this case possesses the advantage not only of receiving the accumulating resistance of the compressed air in front of it, but also the retardation, if worked through a stuffing box, occasioned by forming a vacuum behind it, which greatly increases its power.

An idea of such a general buffer is given in the accompanying sketch fig. 1. The condensation only of the atmospheric air at its usual density is provided for in this construction, for the purpose of making the sketch less complicated; but if the now open top of the cylinder be supposed to have a cover, with a stuffing box in it for the piston rod (when properly adapted to that purpose) to pass through it, both these powers of retardation might be used. When sufficient power for the trains, can be obtained by condensation only, it will be well to make use of the instrument in that way, because it is then more secure in cases of extreme violence from being so injured as not to be able to perform its functions.

Suppose the air cylinder to be six feet in diameter, and the piston to be able to condense the whole charge of air into one-twelfth part of its original bulk, when it has been pushed in ten feet; the power of retardation commencing at zero, and being at the termination about 165 lbs. per square inch, may, including friction, be taken at about 35 lbs. per square inch on the average for the ten feet of stroke; which, on this area of 4071 square inches, amounts to about 63 tons. Hence the whole power of the retardation may be taken as equal to lifting 63 tons ten feet.

The velocity of the ordinary trains, as has before been shown, is equal to lifting their weight to the height of 16 feet, and hence it requires about one ton and six-tenths of retardation for 10 feet, to balance one ton of the train for 16 feet; consequently this general buffer will be equivalent to about 39 tons of the train. This, however, will be sufficient; take the buffer itself at 8 tons, the engine at 12, and the first 9 carriages at 18, making 38 tons in all.

If placing the stuffing box on a sliding plate in the cover be sufficient to obviate the danger of the piston rod not working freely, if slightly deranged by violence, the buffer may be made of considerably smaller size, and of course more light and convenient. By leaving in this case any required portion of air behind the piston, the power of retardation from the vacuum would not commence abruptly, and may thus be regulated also in its intensity. The cylinder must be furnished with a valve or stopcock under command at the end to permit the escape of air whenever it is required to run the wheels nearer together, so as to place them on the turning platforms; and the frame connected with the piston, and which runs freely in a sheath external to the cylinder, both above and below it, is held by a spring catch in its place till some object requiring the action of the buffer be struck.

This buffer is also furnished with stuffed pads at each end, *a b*, to take off the first shock of the *vis inertiæ* of the piston, its frame and wheels, which are necessarily ponderous to be of sufficient strength. These pads turn upon hinges, so as to shorten the length of the carriage when required, as may be seen in the sketch, where the hind one *b* is turned up.

October 6, 1840.

(To be continued.)

ON THE COMPARATIVE MERITS OF PADDLE WHEELS AND SCREW PROPELLERS — REPLY BY MR. HOLEBROOK TO MR. PHILLIPS.

Sir,—I trust I may be permitted to trespass upon your pages with the following remarks, in reply to a paper entitled "Screw propellers superior to paddle-wheels, inserted in your last No. (898), and communicated to you by its author, Mr. Roger Phillips. It is not my intention to combat the dogmatical (I use this word in no offensive sense,) assertions of this gentleman in the way in which they might be, in order to disprove them, because I consider a mere re-reading, of my article in your 892nd and 893rd numbers, to be all that is necessary to confute them, supported, as my observations were, by proof after proof deduced from mechanical scientific works and facts; but I purpose merely to confine myself to strengthening a little the position I maintained, and to removing the erroneous impressions which might be made by Mr. Phillips's remarks, upon some of your readers, who would scarcely imagine that gentleman had so very inattentively read my article, as I shall show he could only have done when he penned his remarks.

Mr. Phillips's diagram itself goes only to establish that which nobody disputes, namely,—merely a propelling power for the screw; and against his mode of estimating the resistance, arising from the inertia of the water, I have nothing to urge: but the point, upon which I differ with him, is his deduction, that "the *whole* power therefore theoretically, would be directly exerted to move any floating body to which the screw might be attached in the direction A. B." According to the hypothesis of Mr. Phillips, which flies in the face of the most palpable results, the useful effect would be exactly and directly proportional to the power employed in making the screw rotate, which I shall show to be utterly impossible. If this hypothesis were just, and it is upon the correctness of it that nearly all Mr. Phillips's conclusions depend, any difference of inclination, of the thread of a screw, from the direction of its axis, might be entirely disregarded, except as to increase or decrease of the amount of resistance. If Mr. P. were right, the greater the amount of the resistance, the greater must be the useful effect. Now the case, in which the resistance would be greatest to the rotation of a screw would be that, in which the thread of the screw made the smallest possible angle with its axis, or, in other words, that case, in which the thread and axis approached in direction to the nearest possible similarity, that the nature of the mechanical instrument, the screw, would allow. To this case, a screw would be represented, for all useful effect in propelling, by a common-paddle wheel placed at the stern of a vessel with the shaft parallel in direction with the keel. In such a case, I ask, would not the resistance be palpably the greatest, and yet what would be the useful effect in propelling the vessel forward? Why, in the case of the paddle-wheel thus placed, positively nothing: and in the case of a screw, such as I have

just supposed, this effect would be as near to nothing as possible. This I think may be sufficient to demonstrate very palpably the inaccuracy of considering the *resistance* as an indicator of the *useful effect*. But, further, were the hypothesis of Mr. Phillips just, then the resistance, being all exerted in propelling the vessel forward, there should be no power tending to propel the vessel sideways, or in a direction contrary to the rotation of the screw; because we could not have the *total* power effective in propelling the vessel forward, and another portion of power, *more than* the *total* power, tending to give motion laterally to the vessel; whereas, if I can show that a portion of power *is* consumed in having a tendency to give motion to the vessel laterally, I think I shall prove that *all* the power cannot be employed in propelling the vessel forward; and, I imagine, I shall have no difficulty in substantiating my position by the case I shall now suppose: Let us imagine a vessel to be fitted with two screws, such as that of the *Archimedes*, these being placed in the positions of the common wheels of a vessel. Now, upon the proper rotation of such screws, I ask, would not the vessel move forward? I think no one will deny that it would; and, yet, if Mr. Phillips's hypothesis of the power being entirely exerted in a direction parallel to the axis of the screw, were correct, the vessel would not be at all moved, because the screw, on one side of the vessel, counteracting the screw on the other side, the power employed to make such screws rotate, would be merely consumed in agitating the water. But this could not be the case, as may be imagined from the effects which would be produced by such a wheel as that of Mr. Samuel Hall alluded to by me at page 302 of No. 893 of the Magazine. Indeed there was a wheel upon this principle lately exhibited at the Polytechnic Institution, and may be probably again when that institution re-opens. Mr. Phillips will not, I am sure, contend that a screw will have the magical property of exerting its force *wholly* in the direction of its axis when it is placed at the stern of a vessel, and, upon the mere placing of it at the side of a vessel, will exert its power *partly* in a direction at *right angles* to its axis; and yet if the screw does not possess this property, what becomes of the theory of Mr. Phillips? Why, it is entirely without foundation.

But if, throwing overboard this gentleman's hypothesis, we assume, according to the well known law of hydrostatics, that the resistance, to the passage of an inclined plane or screw, is given in lines perpendicular to the surface of the plane or parts of the screw, then we have no anomalous and contradictory results; there is then no opposition of appearances and effects to what theory would give; but, on the contrary, there is no other variation of effect, than that which unavoidably always occurs between practice and theory. The laws of which I availed myself in my article, it is unnecessary to state, were not of my making, I have done nothing more than make an application of them, and if I have erred in this application, I am, of course, open to correction.

Mr. Phillips says, "So far from cutting away the inner parts of the screw, the only question seems to me to be *how far are the outer parts necessary?*" Were his hypothesis correct, he would be perfectly justified in his opinion, because he would unquestionably obtain a greater proportional resistance from the inner, than from the outer, parts of the screw; but his opinion, of the resistance and useful effect being equivalent the one to the other, being, as I have shown, entirely untenable, the observation I have just quoted falls to the ground.

With respect to Mr. Phillips's observation about my taxing Captain Chappell with error upon the angle of the screw, I must refer your readers to what I said upon this subject in my communication; from which it will be seen that I was unavoidably obliged to notice what appeared to me to be incorrect; and I can only now say that persons generally would have assumed the angle meant to have been that of the circumferential parts of the screw; but it appears that Captain Chappell meant the angle which was made by the *mean part* of the screw, and not by its *extremity*. Now, if by the *mean part* of the screw, the part midway between the axis and the extremity be meant, even then it appears the angle of 45° is not correct, inasmuch as the angle made at that part is about 48½°; or if the mean angle between the angle at the circumferential

parts and that at the axis be meant, then, as 66° is the angle at the circumferential parts, and 0° that at the axis, the mean found, by dividing the sum of 66° and 0° by 2, as the number of positions, the angle should be 33°, and not 45°. My opinion, if I may be allowed to differ from Mr. Phillips, by supposing that he does not speak Captain Chappell's opinion, which I have no right to assume he does, is that Captain Chappell, in stating the angle at 45°, took that angle to be the proper one, from the general appearance of the screw, in which he might be correct enough; for it appears to me very easy to mistake the real angle of a screw of the kind of the propeller, from some properties peculiar to it, when viewed without measuring it. The remarks I made in my communication upon the angle were, I beg it to be understood, quite incidental, and in order to avoid appearing wrong myself in one part.

Mr. Phillips alludes to my having "theorized myself into sad confusion upon the subject of *slip*," and he goes on to attribute to me what he calls the absurd hypothesis, that the slip in the case of the screw is equivalent to the loss of power. Now I must tell Mr. P. that the confusion and the hypothesis are entirely his own, and not mine. I am not aware that *I* have so confounded the slip and loss of power, but I will quote a few of the words I used. I said, "Some observations which I wish to make on the slip, or, *as it is called in this pamphlet*, the loss of power of the screw, will not here be misplaced." By reading the words I have now underlined with proper emphasis, my meaning will not be so confused as Mr. Phillips thinks. The whole tenor of my observations, whether upon the screw generally or upon the *slip*, does not at all show that *I* could have considered the *slip* as synonymous with the *loss of power;* though it does seem, from Captain Chappell's report, and from the communication of Mr. Phillips, that both Captain C. and Mr. P. entertain something bordering as nearly as possible upon the opinion that the slip and loss of power are one and the same. The *slip*, as every investigator of propelling instruments knows, does not represent the loss of power attendant upon the use of any particular instrument, as loss on this score must wait upon the most possibly perfect propelling machine which acts by the resistance of the water.

I do not see any reason to repent of my mode of estimating the slip of the screw; because, though it is quite true (supposing the vessel to go at the rate of 8.8 nautical miles per hour, while the screw could only, if it worked in a solid, propel it at the rate of 10.9 nautical miles per hour,) that the slip may thus be less than one-fifth; yet, on the other hand, when it is considered that, in order to accomplish an advance equal to the length of its axis, or of 8 feet, even if working in a solid, the circumferential parts have to pass through a space equal to more than 18 feet. I think there is sufficient reason for estimating the slip of the screw according to the plan I pursued, and, therefore, at an enormously greater amount than Captain C. or Mr. P. does; for we might as well assume that a man, who chose to pursue a circuitous route towards an object, instead of a direct one, passed over no ground uselessly, as calculate the slip of the screw as Mr. Phillips and others have done.

I now come to that part of Mr. Phillips's communication in which he says that "Mr. Holebrook cannot discover how the action of the screw should alter the position of the ship's head some points previous to her getting way, a fact attested by several respectable and disinterested witnesses." Now it is very remarkable that I not only did not say what is imputed to me, but that I said exactly the reverse. I now quote the words I used, which were these: "With respect to what is stated under the head of Steerage I would observe, that it is very easy to understand how the screw-propeller facilitates the turning of the vessel." From what I have here quoted it will appear, that far from denying the evidence of the respectable witnesses alluded to by Mr. Phillips, I attributed the same property to the screw, in the respect of turning the vessel round, that these witnesses, as well as Captain Chappell and Mr. Phillips, give to it. Mr. Phillips must have read my observations upon this part of the subject very inattentively indeed, to have attributed to me the reverse of the opinions I entertained and stated. With respect to my different method of ex-

plaining the cause, until I see some better reason than any which Mr. Phillips gives in his communication for correcting it, I must take the liberty of maintaining the opinions I stated in my article. Further, had this gentleman carefully read and considered my communication, he would not besides have observed, that "if Mr. Holebrook's theory were correct, the fluid would never be driven near the rudder by the action of the screw, much less forced thus violently against it;" Mr. Phillips would, on the contrary, have perceived, from my statement, that I said, that, "the water is not really thrown off in radii, though it may appear to be so; but is thrown off in perpendiculars from the surface of every part of the screw;" and from this, my theory, he would have seen, that some of these perpendiculars must necessarily impinge upon both sides of the rudder.

(To be concluded in our next.)

PADDLE-WHEELS v. SCREWS.

Sir,—The *Archimedes* discussion respecting the relative efficiency of the screw and the paddle for propulsion, resolves itself into the theory of the locomotion of birds and fishes. It must be acknowledged that this theory is at present very imperfect, or rather, that nothing satisfactory on the subject has yet been published. It is well known that the propelling power of fishes resides in the tail, or properly speaking, in the whole posterior portion of the fish, and that the muscular force producing it is far greater than any human ingenuity can compress into the same weight and space, as there are reasons to believe that the velocity of fishes, in some instances, is not much less than that of the swiftest birds. It is, however, not so obvious, how the action of wings can produce such power of locomotion through so rare a fluid as the air, but in both cases we see sufficiently that such locomotion is produced by a series of impulses. Now no successive impulses can be given without recovering, between each, the position of making a fresh one, and such backward motion must be accomplished, *in the same fluid*, with great rapidity and with very little friction or counteraction. The mode by which this "feathering of the oar" is effected through water, without a corresponding retardation, is a problem which mechanical *man* has not yet been able practically to solve in any degree approaching the success of birds and fishes in doing it, and that without the use of any spiral movement; for nature, amidst all her variety, has not in a single instance, I believe, made any animal to screw itself along. Who then, employing his unprejudiced reasoning faculties in the particular case of a body floating on the *surface* of water, would not take advantage of the denser medium to make the propelling stroke, and avail himself of the power of making the next through the rarer one of the air?

That vessels fitted up on the plan of the *Archimedes* will be very useful in commerce by the use of steam as an auxiliary to sails, I am fully prepared to admit, and therefore, that Mr. Smith's is a very valuable invention—with this he ought to be content without seeking to substitute it in all cases, for I think nothing is more clear than that, with equal power in similar circumstances, no contrivance whatever *totally immersed in water* can compete with the common paddle-wheel, or with any other propulsive power, which recovers its stroke through the air.

H. A. M.

THE DIFFERENT SYSTEMS OF CONDENSATION.

Sir,—I have hitherto thought proper to be a silent observer of the many remarks in your journal on my system of condensation by re-injection, but a sense of duty to myself causes me to write, and I trust will induce you to insert the present communication.

But first I will notice a statement of a correspondent in your last Number, that he witnessed this plan in operation (Mr. Symington's arrangement) on board the *Dragon* tug boat for two hours alternately with the ordinary plan, during a day, and that a saving of one-fourth of the fuel was effected by it. Allow me boldly to *assert*, that either your correspondent has been most shamefully imposed upon, or that he himself is attempting to impose upon others, and

that no such advantage can be obtained by *any* plan of condensation, my own of course included, over the common one in such time or manner; and I for one should be ashamed to practise or hope to benefit by the practice of such deception.

Now as to the claim of Mr. Symington (allow me to reiterate) to the method by continual re-injection of the same water gradually cooling it by surface exposed to external cold water, and not confining the claim to the mere position of that surface, I have said my say in your journal long since. Your intelligent correspondent, "Scalpel" has alluded to the *City of Londonderry*, and to the failure of the plan as tried (and *thus* it must needs have failed) in that vessel by Mr. Symington. On this I have to observe, that I applied to the company (the Peninsular) owning that vessel on their infringement of my patent, and should have had recourse to legal means had they not abandoned it, and in such manner I shall again act if needful—else what's the use of a patent? Besides, the patent of Mr. Symington was taken out for another invention, and thus I was deprived of the opportunity of opposing it in an earlier stage had I thought proper; a *laisance* that the patent law justly punishes more severely than any other.

And now I call upon Mr. Hall honourably to correct *his* publications of an *official* document, viz.: the Report of Messrs. Lloyd and Kingston to the Admiralty on his plan of condensation. He has made an omission that caused me some surprise at the time, (for I have the highest opinion of the honour and impartiality of these gentleman,) but which, so far as regards them, was removed by my accidentally seeing a true copy of the report about two years ago. I have hitherto deemed this beneath my notice, and had indeed forgotten it, but have now been reminded of it by an article from a correspondent in one of your late numbers, and therefore it has become rather a public than a private matter.

Mr. Fox has made a curious estimate of the action of the two plans of condensation (let us call them "by refrigeration," and "by re-injection,") in regarding it as merely the cooling of so much hot water. Where, Mr. Fox, are you to put the *latent* heat of the steam? and that too to be got rid off in *an instant* through metal generally coated with grease. (Let the shade of Watt answer, where!)

For the present I will conclude by stating, that it was the want of full success on trying the method by refrigeration that led me originally to invent and carry into effect the process by re-injection; for the continued use of the same liquid, with a good vacuum, was essential to my plan of vaporization, which latter I should add (unlike the process of condensation) has proved defective in some practical points, after many attempts on the great scale more or less successful. Further, none of your correspondents having as yet given a full exposition of the action of the method of condensation by re-injection and of its advantages, you will allow me an opportunity, having had no little practice on the subject, of doing so, if in the mean time it be not better done by other hands.*

I am, Sir,

Your most obedient servant,

THOMAS HOWARD.

King and Queen Iron Works, Rotherhithe, Nov. 10, 1840.

MR. SYMINGTON IN EXPLANATION OF HIS METHOD OF CONDENSATION.

Sir,—When the Fox preaches let the geese beware. In reply to Mr. Fox's challenging letter in your 898th Number, I have merely to observe, that as one well-established fact is worth a thousand assertions, I can produce three which will test the value of his opinions and rather spoil his sermon.

Mr. Fox says, "that he has no hesitation in asserting that the doing of that which I propose is totally impossible," while Mr. Hall on the contrary, has effected all that could be desired. In this with all the zeal, and with but little of the discretion of a friend to Mr. Hall, he attempts to claim more for that gentleman to the disparagement of his competitors, than he will find it easy to maintain.

Having no wish to say a single word

* We shall be glad to hear again from Mr. Howard on these points.—ED. M. M.

against Mr. Hall's invention, I will not allow myself to be dragged into any controversy on the merits of our respective inventions, nor tie myself to the use of pipes of 7, 4, or 3 inches diameter; but I shall content myself by stating what has actually been done with my method of condensation as the best proof that it is valuable, and requires only to be more generally known to come into universal use.

Three vessels have been fitted with the Symington plan of condensation, the *City of Londonderry*, the *Dragon*, and the *Fletchers Dispatch*. The *City of Londonderry*, the first vessel to which the apparatus was applied, was fitted with rather a scarcity of cooling surface, which I have never attempted to conceal, but have always publicly avowed, as Mr. Fox might have been aware of, if he had been much acquainted with an invention concerning which he asserts so much and proves so little. But even under such circumstances what were her performances? She performed three successive voyages to and from Gibraltar, using the apparatus out and home, during which the boilers were kept perfectly clean, and the consumption of fuel diminished from 18 cwt. to 1 ton per hour to 13 or 14 cwt. When the apparatus was removed, the *Londonderry* was not so successful. The usual consumption of fuel took place, her boilers again became salted, and she was so unable to keep her time, which she had always been able to do with my apparatus, that she was dismissed the service. A better instance of the value of the invention could not have been afforded than its application to the *City of Londonderry*, as I am able to substantiate should there ever be a necessity for so doing.

The *Dragon* was the next vessel fitted. Her boilers have been in use for nearly three years, with the apparatus, and the consequences have been that a saving of one-third of fuel has been effected, and the boilers kept perfectly clean.

The *Fletchers Dispatch*, has, in one of the most muddy rivers in England, the Humber, run for a year with clean boilers, and a saving also of one-third of fuel.

Mr. Fox thinks it an impossibility to keep the engine properly at work on my plan for a consecutive hour. He will find that the engines of the *Dragon* and the *Fletchers Dispatch* have been kept at work for several consecutive days, during which time the refrigeration must have been tolerably perfect, notwithstanding Mr. Fox's presumption of there being no distilling apparatus or anything of the kind to afford an additional supply of pure water.

Cooling down steam-engine condensement in a pond or reservoir, and using it again for the purpose of injection, was successfully and publicly practised by my father in Scotland about fifty years ago. And if I have succeeded in doing by my plan that which Mr. Fox acknowledges Mr. Hall, even aided by the ingenuity of so skilful an engineer as Mr. Fox himself could not do, surely he must allow that I am entitled to the same credit that one of Mr. Hall's friends claims for him in your pages, for accomplishing that which had foiled the celebrated James Watt.

In addition to the preceding, I would further observe, ("if you will excuse me for saying so"), that Mr. Fox, with all his information and deep penetration, will scarcely be able to prevent in future, your correspondents from running into errors respecting any plan of condensation; for most assuredly, judging from the specimen he has afforded, there is not an engineer of tolerable understanding who would have ventured with such a scanty stock of knowledge of the subject as he displays to have boasted that, "I am the person who, in answer to some inquiries from the Lords Commissioners of the Admiralty, wrote the letter to Captain Gipps," &c. That I am right in my opinion of Mr. Fox's incompetency for answering such questions, there will be no difficulty in showing from his own assertions.

In comparing the two inventions, Mr. Fox says, "The case is simply this: in a pair of engines of 200 horses power, Mr. Hall, by his method, has only about 13 gallons of water per minute (viz., that which results from the condensation of the steam) to cool by means of metallic surfaces to the degree required not to injure a vacuum; whereas Mr. Symington has, by his proposed plan, to cool nearly 100 times as much."

Again—"Now I presume, that although the refrigeration of 13 gallons of water per minute can be perfectly and

practically effected, it is quite another thing to have to deal in the same time with 1213 gallons per minute."

According to this assertion, it would seem that the condensation of the steam with Mr. Hall's condensers is effected without any cooling power at all, otherwise, whence are the 13 gallons of water procured?

Agreeing with Mr. Fox, "that this is an important matter that must not be overlooked," I shall endeavour to place it in such a light that even he himself may understand it.

In working a pair of engines of 200 horses power, with steam at a given temperature, the quantity of heat to be disposed of to effect condensation by either methods is precisely the same; for the 13 gallons of water, and the steam which produced it, by Mr. Hall's process, contain exactly the same quantity of heat as that of the contrasted 1213 gallons of water to be cooled by my process.

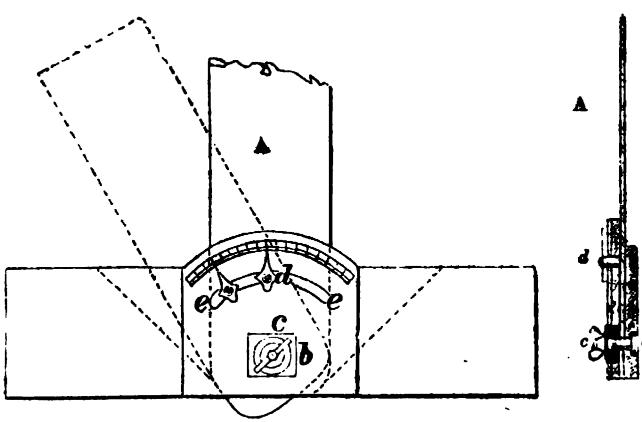
Will Mr. Fox assert that the whole of the steam of the 13 gallons of water said to be cooled down by Mr. Hall's process, is submitted to the cooling influence at once for one minute, or that it is not admitted into his pipes in rapid and successive portions; or will he attempt to deny that the whole of the condensement can be submitted for one minute, or even longer, by my process?

I am of opinion he will be obliged to confess that each successive portion of steam passing through Mr. Hall's apparatus is not allowed even three seconds to pass into the state of water, and bring it down to the necessary temperature.

I am, Sir,
Your most obedient Servant,
Wm. Symington.

Wangye House, Essex, Oct. 31st, 1840.

IMPROVED DRAWING SQUARE.



Sir,—The enclosed sketch exhibits an arrangement for the more perfect and expeditious delineation of beveled or angular lines than can, in my opinion, be obtained by that at present in use.

I am aware that some attempts have been made to apply the sector to the ordinary T square; one in particular I remember as being described in one of the vols. of the Transactions of the Society of Arts: a large brass sector was attached to the back part of the stock of the square, and the blade extending back some distance, had on the end of it a pointer, which indicated the angle required. The clumsiness of the mode is sufficiently obvious.

I may perhaps be allowed to say, that

that now submitted to the impartial consideration of your judicious readers, in my opinion, only requires that attention in the fitting up which all mathematical instruments demand, in order to render it a simple yet complete mode of attaining the end proposed.

Though the sketch scarcely requires explanation, yet for simplicity's sake I will say that the blade A swivels on the stud *b*, one end of which is a screw, on which works the thumb-screw *c*, used for tightening or fixing the blade at the given angle. Attached to the blade is another small stud *d*, carrying a pointer as shown. The groove *e e* being cut in the upper part of the stock, it is clear that the stud and pointer is thereby allowed to move with the blade, whether to the right hand or to the left; and there being a brass plate upon the upper surface of the stock, with the various degrees marked upon it, the pointer accurately indicates the angle of inclination of the blade.

I would make just one other comment, and that is, that by having a steel blade, the pointer stud may be fixed with greater ease than in wood, and the mathematical precision of the instrument would be increased.

I am, Sir,
Your most obedient Servant,
T. C.

Manchester, October 24, 1840.

EXTINGUISHING FIRE BY STEAM.

Sir,—In No. 896 of your useful publication (vol. xxxiii, page 371,) Mr. Baddeley confounds the observations of two different speakers, in supposing the person who asserted that the Philadelphia firemen direct the stream of water to the lowest part of the fire, also asserted that the firemen of London now follow the same practice; and he concludes, that there is no dependance to be placed upon the statement respecting the Philadelphia, because the assertion is not true of the London firemen.

The fact is, that at the meeting of the Mechanical Section of the British Association at Glasgow, in corroboration of Mr. Wallace's proposal to extinguish fires by enveloping the burning mass with steam, I stated that it was the practice of the Philadelphia firemen to throw the stream of water from their engines upon the lowest part of the fire, for the express purpose of generating steam, to arise, surround, and thereby extinguish the higher parts: while the London practice was, to throw the stream of water upon the upper part of the fire, under the vain imagination that it would fall, as water, and drench the burning matter below. I added, that I had often seen at fires in London, the whole stream of water wasted, by being converted into steam while passing down through a small portion of the upper flame, without a particle of the water reaching the burning materials, and the steam going off into the air above. Upon this statement, a gentleman of high consideration in the scientific world observed, that I was in error respecting the London practice, for that he had been informed by Mr. Braidwood, the superintendant of the London Fire Brigade, that he always directed his men to apply the water to the lowest part of the fire, when practicable, for the very purpose of converting it into steam to extinguish the parts above.

I explained, that on my arrival from America, 37 years ago, I laboured to instil into the minds of the London firemen, the value of the Philadelphia practice, but without success, for many years during which I persisted in recommending the same, but as I approached old age, I avoided crowds, and therefore had not seen a fire, except at a distance, for several years past; I was therefore very glad to hear that the improved system had at last been adopted by Mr. Braidwood.

In conclusion, I assure Mr. Baddeley and your readers, that the mode which I have stated, was the regular practice in Philadelphia forty years ago. Mr. Baddeley appears to think that in the experiments alluded to, the fires were extinguished more by the exclusion of air than by the introduction of steam; in this he is certainly in error. For even if the air could be perfectly excluded, the extinguishing would go on so slowly, that more hours would be required to cool down the mass below the point of re-ignition on the admission of air, than it would take minutes to effect the same purpose by means of steam.

I am, Sir, yours, &c.
JOHN ISAAC HAWKINS.

Quality Court, Chancery Lane, Oct. 28, 1840.

[*Having referred Mr. Hawkins's letter to Mr. Baddeley, he has favoured us with the following remarks upon its contents.*]

Sir,—However incredible the fact may appear, relative to the absurd practice of the Philadelphia firemen, the testimony of Mr. Hawkins is sufficient warrant for its existence—but, "tis forty years since!" Experience has the effect of making people in all countries, both collectively and individually, wise; and I think there is little doubt the practice of the Philadelphians, like our own, both in this and in other matters,

is somewhat more rational than it was forty years ago. Had a practice so diametrically opposite to that of all other countries, existed at this time in Philadelphia, it is scarcely possible that it should have escaped the notice of all modern visitors; the inference therefore is, that it has long since been abandoned.

As Mr. Hawkins was dealing with names, it is to be regretted he did not give that of "the gentleman of high consideration in the scientific world" who made the unfounded statement respecting the London firemen. I have the authority of Mr. Braidwood for stating, that he never made such a communication as that attributed to him, to any person whether of "high" or low consideration; and if ever "the gentleman" alluded to was in communication with Mr. Braidwood at all, he must have either wilfully perverted or grossly misunderstood what was said to him. In Mr. Braidwood's interesting work on Fires and Fire Engines, published in 1830, he lays it down as an invariable rule "*that the water on its discharge from the director should strike the burning material.*"—"That this is a point to which every thing should be made subservient; and that this cannot be too often or too anxiously inculcated on every person having charge of fire-engines." The additional experience of the last ten years, in a more extended field of operation, has not induced Mr. Braidwood in the slightest degree to change or even modify this opinion.

From the concluding paragraph of Mr. Hawkins's letter, it may be inferred that the extinguishing of fires is a subject to which he has hitherto paid little practical attention. The great value and importance of the *air excluding system*, is every day becoming better understood, and we frequently witness the beneficial effects of its skilful application. I have observed with pleasure that this matter has been taken in hand by public lecturers, who by analogy and experiment have shown its philosophical correctness.

There are many people who entertain a sort of superstitious notion of the supernatural powers of steam, and imagine that because this mysterious agent does so much, it can do everything! As a motive power its application is almost universal, but any attempt to employ mere vapour as an extinguishing agent, under ordinary circumstances, is certain to be abortive.

I am, Sir, yours respectfully,

WM. BADDELEY.

November 2, 1840.

FIRE-ESCAPES—THE RIGHTS OF INVENTORS.

Sir,—I observe by your last Number you state, in answer to an enquiry, that no reward has been offered "for the best design for a fire-escape," which is perfectly correct. The enquiry is perfectly natural, and coincides with a notion which unfortunately too generally prevails—viz., that the lamentable loss of life which is continually taking place in this metropolis, is the consequence of no efficient fire-escape having hitherto been devised—that the difficulty or deficiency is a mechanical one—that lack of ingenuity is the occasion—and that the production of an all-sufficient instrument would make the fortune of its inventor. Nothing could be further from the truth, however, than this position; the fact is really the reverse. There are *several machines*, some of them long before the public, which, *if adopted*, would in most cases have prevented the deplorable catastrophes which we all lament, though our lamentation is in vain. So far from the existence of any mechanical deficiency, many of the plans submitted have been amply sufficient for most practical purposes; which of the several really good ones is the *very best*, may be a legitimate object for enquiry. So far from the subject of escape from fire being a profitable one for inventors to take up, the history of the last fifty years will show that it has never benefited a single individual. The sums of money expended in patents, in experiments, and in advertising, with all the other etceteras, which swallow up the scanty means of the inventor, have in no one instance been repaid. The Government, the Corporations, and the police authorities, have hitherto turned a deaf ear to the appeals of suffering humanity. Private individuals have not had the means, nor societies the inclination, adequately to remunerate the inventors, who, actuated at first probably by sympathy for their fellow-creatures, have been led to "take up the trade" of averting their dangers, but who have found no response from the unworthy objects of their care.

As long as great perseverance, extreme toil, and impoverishing expenditure must be encountered, to effect the sale of "single copies" of an invention, the inventor will most likely have the field to himself; but let a company or a corporation require several, so as to make the prize worth trying for, and then the inventor finds plenty of rivals ready to step into the arena, and without any previous study or outlay, and without the requisite experience, snatch from him that boon which should have been his recompense for the cares and anxiety of by-gone unproductive years.

The following quotation from the City report, published in your 898th Number, in juxta position with an extract from an advertisement in your last, may be taken as showing to what disreputable lengths this unrighteous principle of competition will sometimes lead *respectable* (?) tradesmen.

"Messrs. Harvey and Braidwood recommend the adoption of a certain number of sets of brigade ladders, on a fitting carriage, *with the rope, belt, and other conveniences to facilitate descent.*"	"The advertiser recommends the fire-ladders adopted by the London fire establishment, as being simple, fitting each other universally, and *without extraneous appendages to impede their application.*"

My experience has till recently been with fire-engines, rather than with fire-escapes; I have, however, paid enough attention to the latter subject to see through the groundless insinuation here attempted to be conveyed, and the object for which it has been put forth. I find that all the fire-escape inventors of the last half century have considered it necessary to append some "*conveniences*" or other "*to facilitate descent;*" and that from Davis* downwards, all the advocates for the employment of ladders, of whatsoever form, have, without a single exception, equipped their machines with "a cradle" or other appendage for this purpose. As a merit is attempted to be made of the bare ladders, "without extraneous appendages," I beg to observe that, in the first place, they are *unsafe and inefficient as police fire-escapes*, without what the advertiser is pleased to call "extraneous appendages;" secondly, that these useful appendages, as applied to Merryweather's ladders, *do not in the slightest degree impede their application.*

The ingenious but ill requited Gregory has been toiling in this "labour of love" more than twenty years. In January, 1819, he patented his improvements in fire-escape ladders, and quitted his profitable avocation of a shipwright to minister to the then apparent wants of his fellows. His ingenuity has not been exclusively devoted to escape from fire—the perils of the ice and the fatal consequences of external window cleaning have been the successful objects of his care. For my acquaintance with many of these creditable productions I am proud to acknowledge my obligations to your indefatigable correspondent, Mr. Baddeley, whose continual advocacy of inventions rather than inventors, shows his object to be the promotion of public rather than private good.

The recent "movement" in the City—the very necessity for which reflects the most enduring disgrace upon the authorities—exhibits in a striking manner the ordinary fate of inventors and improvers. The two plans selected for adoption are palpably the portable fire-escape ladders of Merryweather, and the sliding carriage ladders of Gregory; but it is more than probable that neither of these parties will have a chance of obtaining, or even of competing for, the honour or pecuniary advantage of furnishing these contrivances, which they have respectively brought to perfection! Methinks I see the object of the "*improving*" hand, alluded to by Alderman T. Wood, as reported in your last Number, and can only express my surprise that upright men of business should sanction proceedings collectively, of which individually they would be thoroughly ashamed. Depend upon it the claims of justice and the rights of inventors are identical with, and inseparable from, the rights of

HUMANITY.

Lombard-street, November 9th, 1840.

* Rewarded by the Society of Arts in 1809.

CITY FUNDS *v.* CITY FIRE-ESCAPES.

Sir,—The City authorities occasionally make a wonderful parade of their love of economy, apparently quite aware of the extremely slender reputation they possess for the exercise of this virtue; consequently, the subject of *fire-escapes* not being a legitimate source of feasting, the smallest possible sum must be expended for their introduction to the City.

The pretence of husbanding "the city funds," is a miserable excuse for withholding a due and efficient protection of life and property, when so trifling an addition to the outlay at present incurred, would effectually accomplish that object. The idea is quite absurd as emanating from the Court of Aldermen, because they are now expending 600*l.* a year in printing and circulating among themselves a "Sessions Paper." The public have long since abandoned any interest in its publication, and yet it is kept up for the purpose of adding to the library of the Aldermen and Common Council. £600 a year can thus be expended for the personal gratification of the corporation members, while one outlay of a similar sum to ensure the protection of the lives of all the citizens is miserably begrudged. It has been shown in your pages, that the outlay of this sum, with an annual expenditure of 20*l.* a year, would provide for our safety for ever!

If the city coffers are so low, the profits of the City School might be advantageously appropriated to the purchase and maintenance of fire-escapes. In this school fifty boys are taught by one master, who receives about 120*l.* year. The boys' parents pay 420*l.* a year; the profits therefore upon this transaction, would more than suffice to support a numerous, and well-appointed fire-police. Other resources could be pointed out, but this may suffice for the present.

I am, Sir, yours, &c.,

A CITIZEN.

Ivy-lane, Nov. 5, 1840.

[We cannot understand why there should be any pecuniary difficulty in the case. If the whole sum required was obtained by a slight addition to the present police rate, it would be so trifling as to be altogether beneath notice, while its judicious application would be highly popular throughout the city. ED. M.M.]

NEW PUBLICATIONS.

Directions for using Philosophical Apparatus in Private Research and Public Exhibitions. By EDWARD M. CLARKE. Part I. 72 pp. 8vo. Author, 428, Strand.

Mr. Clarke, the popular lecturer on optical subjects at the Royal Adelaide Gallery, and no less eminent as a *philosophical* instrument maker (in the truest and largest sense of the term), has presented us here with the First Part of a work which promises to be of considerable magnitude, and will, we feel assured, be universally hailed as a much-needed and most valuable contribution to practical science. The author proposes to give "plain and simple directions for the use of *every article of philosophical research*"—to do for all experimental philosophy, in short, what Professor Faraday has done so well for one important branch of it in his "Chemical Manipulations." The specimen Part before us is confined to the gas microscope and its manifold wonders; and is so well executed throughout, that he must be hard to please who could desire more than to see all the forthcoming Parts equally good. The "Directions" are exceedingly full, distinct, and clear; and the wood-cut illustrations not only abundant to profusion, but of a very superior character. The second Part, which we hope will not be long in making its appearance, is to be occupied with the construction of the Polariscope and the various phenomena of the polarization of light.

The Excise Officers' Manual and Improved Practical Guager; being a compendious introduction to the business of Charging and Collecting the Duties of Excise. By J. BATEMAN. 354 pp. 12mo. Maxwell.

Time was when we had no Excise, and being of the opinion of Marvel that it is a very hateful, pernicious, and unconstitutional mode of raising a revenue, we may be permitted to hope that such a time will come again. While the system exists, however, it is manifestly of great importance that it should be based on some fixed principles of universal application, and that these principles, and the various modes of working them out, should be made familiar to every one of the numerous and widely scattered body of persons who must of necessity be employed to carry the system into operation —and this not more for the sake of the public revenue, than for the sake of those of the lieges who are forced in this way to contribute to it—since even in the suffering of hardship and injustice, there are rights of equality which should by no means be disregarded. It would assuredly be long before we could bring ourselves to see with the author of the work before us, "a useful *hive* of the commonwealth" in a host of Excise Officers;—for where there is no honey we can scarcely expect bees; but we readily admit, that the better informed these officers are—(the more *geometrically* the *spiders* do their work?)—the better it will be for all classes and all interests. Neither can a subject which has occupied the talents of such men as Simpson and Hutton and Young, be unworthy of any degree of genius and talent which can be devoted to its elucidation. The standard book of this class has been for a long time "Symons's Guager;" but that must at last give place to the greatly superior work now before us. Indeed, Mr. Bateman tells us that he had at first only contemplated giving a new edition of Symons, and that it was only as he proceeded in his task, and found alterations and additions accumulating, that he judged it expedient to make a new book of it altogether. *Bateman's Symons*, as it may therefore not be improperly called, is now an exceedingly complete work, comprehending everything which an officer desirous of doing his duty well, and of qualifying himself for the highest as well as humblest offices of his department, ought to know, and no more. We have first, complete treatises on the arithmetic, of simple numbers, and of quantities; and on the mensuration of lines, angles, superficies, and solids, including a great variety of most useful arithmetical and mathematical tables, very neatly and correctly printed. We come next to the master subject of the book—gauging—which is extremely well treated of in all its branches. In the sliding rule which Mr. Bateman recommends for adoption, we are glad to observe that he has adopted the line of special gauge points X, invented by our esteemed correspondent, Mr. Woollgar (see *Mech. Mag.*, No. 849), and does full justice to its valuable properties. Following these scientific portions of the work is a very full account of the Excise establishment, the duties of its numerous departments, forms of procedure, regulations, &c., and an alphabetical arrangement of the various articles and things subject to Excise—which last, while it does great credit to Mr. Bateman's powers of condensement and classification, may well make the judicious grieve, to think that so much ingenious pains should have been taken to thwart, embarass, and cripple the industry of the country.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

ARTHUR WALL, OF BERMONDSEY, SURGEON, *for a composition for the prevention of corrosion in metals, and for other purposes.*—Roll's Chapel Office, October 15, 1840.

This composition is prepared in the following manner:—20lbs. of strong muriatic acid are diluted with 3 gallons of water and

placed in a shallow cast iron vessel; 112lbs. of steel or iron filings are heated to redness and quenched in the diluted acid to effect their oxidation: to facilitate this action, the pan is placed on a furnace or sand bath, and the contents repeatedly stirred for about 24 hours or until ebullition takes place, the liquor is then drawn off, and the foregoing process repeated with such portion of the filings as remain unoxidized. The oxide thus obtained is exposed on a red hot iron plate, till all the moisture has been driven off, and the oxide assumes a red appearance. When cold 16lbs. of quicksilver are to be added to the mixture, by sifting through a fine sieve, and afterwards intimately incorporated in a mortar; enough water to cover the surface is then poured over it, and from 8 to 9lbs. of strong nitric or nitrous acid added; this mixture is to be placed in a sand bath till all the moisture is driven off. When the mass is dry it is to be well pounded in a mortar till it assumes a uniform state of blackness. All the finer particles are to be separated by washing in water, and left to settle; the sediment is to be placed in a crucible or earthern retort with a receiver attached to collect any chloride or mercury that may come over. When red hot plunge it into fresh boiling water, stir it well and leave it to settle, then draw off the water and add any chloride that may have come over into the receiver. Then add one-fourth of its weight of common black or red lead according to the colour desired. This composition is to be mixed with boiled linseed oil with one-fifth of spirits of turpentine, and applied as thinly as possible with a brush to the sheets of metal to be protected. The metal coated in this manner is to be dried by the application of heat, beginning with a low temperature, and gradually raised to about 300° of Fahrenheit, so as to make the metal "*imbibe*" (!) the preparation.

The claim is, for the invention of the composition prepared as above described, for the prevention of corrosion in metals, and for other purposes.

Francis Molyneux, of Walbrook Buildings, London, Gentleman, *for improvements in the manufacture of candles, and in the means of consuming tallow, and other substances for the purposes of light.* Enrolment Office, October 23rd, 1840.

These improvements are of two kinds, the claim being—1st, To a mode of applying cylinders, or blocks of tallow, or other suitable substances, which are formed without wicks, for the purpose of being consumed in lamps. 2ndly. A mode of applying air to carriage lamps. The mode set forth in elucidation of the first claim is so exceedingly similar to that of Messrs. Crosse and Blackwell, described in our 899th Number, that we need not repeat it here. The only difference between the two is in the construction and application of the wick, which we think inferior to Messrs. Crosse and Blackwell's plan.

The object of the second claim is accomplished by supporting the socket of the lamp upon a series of small tubes, which, passing through the bottom of the lamp, allow free entrance to the atmospheric air, and thereby tend to perfect the combustion.

Henry Montague Grover, of Boveney, Buckingham, Clerk, *for an improved method of retarding and stopping railway trains.*—Enrolment Office, November 2, 1840.

The "method" here patented, if not an improved, is at least an abundantly "singular" one. From the lower frame of the carriage or truck a wooden block or box is suspended by a bar link, within about half an inch, more or less, of the wheel; this box contains a large soft iron horse-shoe, enveloped with wire helices for converting it into a powerful electro-magnet when its good offices are required. From these helices, wires proceed up into the carriage where a galvanic battery is situated, and with which they can be connected at pleasure. Should any accident or other circumstance render it expedient to retard or stop the train, connecting the wires with the battery converts the horse-shoe into a powerful magnet, which, hanging within a "striking distance," catches hold of the rim of the iron wheel, pressing itself and the wooden box against it, after the manner of the brakes usually employed. The patentee states that these electro-magnetic brakes may be applied to one or more of the wheels of a train, or the apparatus may be applied to one wheel, and its action transmitted to other wheels by means of levers. We apprehend Mr. Green has greatly underrated the extent of power required to arrest the progress of railway trains, and the electro-magnetic power capable of being obtained by the means he proposes

Thomas Gadd Matthews and Robert Leonard, of Bristol, Merchants, *for certain improvements in machinery or apparatus for sawing, rasping or dividing dye woods or tanners' bark.*—Roll's Chapel Office, Nov. 5, 1840.

These improvements consist in certain arrangements of circular saws, by means of which, woods or bark are reduced to a finely divided state for the use of dyers and tanners, in a more economical and expeditious manner than has heretofore been effected. The peculiar feature of this invention is, combining a number of circular saws upon a rotary spindle in such a manner that although not in actual contact, they are placed so nearly contiguous to each other, that when a piece of wood, or a quantity of bark is brought under their operation, it will be sawn, rasped, or reduced to a finely divided state without leaving any veneer. The circular saws are

mounted on their spindle by obliques thereto, and the space between each saw is filled up with pieces of wood, felt, metal, pasteboard, or other suitable substance, the saws are then secured between two cheeks by nuts and screws. The log of wood is placed upon an inclined plane, and made to slide down towards the saw by a pushing apparatus, consisting of a worm wheel, rack and pinion, driven by suitable gearing connected with the prime mover of the machine. A counterbalance weight is attached to the rack by a cord passing over a pulley, to facilitate its ascent up the inclined plane, for the introduction of a fresh log of wood. The claim is to the application of rotary circular saws to the sawing, rasping, or reducing to powder of woods or bark, for the use of dyers or tanners in whatever manner the same may be applied.

George Mackay, of Mark-lane, Ship-broker, *for certain improvements in rotary engines.*—Rolls' Chapel Office, Nov. 5, 1840.

A large metal wheel of any suitable width is mounted on gudgeons in a strong frame; six projections, angular on one face and flat on the other, are placed at equal distances around the rim of the wheel. A quadrant shaped groove or race is supported by the frame over the wheel, furnished with a steam pipe at the one end, and an eduction pipe at the other, answering to the ordinary steam cylinder.

On admitting the steam to the reservoir or quadrant, its elastic force is exerted between an entrance valve which opens only inwards, and cannot yield but acts as an abutment, and the projection on the periphery of the great wheel; the latter, exactly occupying the space between the outer rim of the wheel and the interior of the quadrant, is driven forward, receiving on its surface the full force of the steam, until it reaches the mouth of the eduction pipe, when it lifts and passes out through the exit valve, which is immediately closed again by the action of a strong spring. Another of the projections, has in the mean time entered the quadrant, and is acted upon in a similar manner; the motion being equalized by a fly-wheel.

The construction of the entrance valve is so arranged, that when it opens, a lever attached to it closes the steam-cock, which is reopened by the descent of the valve; so that the steam is always shut off during, and readmitted after the entrance of each projection. The closing of the entrance valve is effected by a spring, connected with a click and ratchet, so as to regulate its strength at pleasure. The patentee does not confine himself to the precise form or arrangement of mechanism shown, but sets forth the above as a convenient mode of carrying out his invention; he does not claim any of the parts separately but simply as they are used in combination.

Auguste Moinau, of Philpot Terrace, Edgeware Road, Clock-maker, *for certain improvements in the construction of time-keepers.*—Rolls Chapel Office, November 9, 1840.

This invention, or improvement, consists in certain novel modes of producing or communicating an impelling power for giving motion to the works of clocks, or other stationary machines designed to indicate mean time, by dispensing with the use of impelling springs, and adopting in lieu thereof a series of detached weights, which are raised and brought into operation by means of the impelling apparatus. We altogether despair of making our readers acquainted with all the *ingenious contrivances* and mechanical minutia of this patent, the description of which occupies four skins of parchment, and is illustrated by 41 explanatory drawings, some of the most intricate character; the value of this *loss* will, however, be tolerably apparent from the following epitome of the subject. In the first instance motion is given to the arbour of a large wheel, by means of weights in the form of small balls, which drop into appropriate cups placed at the extremities of the arms of the wheel.

These balls are placed in an inclined tube above the wheel, and are dropped at proper intervals into the cups as they present themselves for their reception, and by their gravity produce rotation of the wheel, thereby impelling the train of wheels constituting the time-piece. The balls drop from the cups, as they approach the vertical position, into a receiving tube placed below, from whence they are returned to the elevated position ready for another descent, by natural—not supernatural—agency. In order to effect the resurrection of "the fallen" weights, a lever is appended to the room door, from which a rope passes over a complicated system of weights and pullies, which being set in motion every time the door is opened or shut, raises at each movement a certain number of balls and so replenishes the moving power of the clock. The rise and fall of the water level in a water-but, is also made to accomplish the same end; and if the house should be furnished with neither doors nor water-but, a *smoke-jack* is then pressed into the service. Two modes of appropriating these motions to the elevation of the balls, is shewn; the first is by a system of levers, the second by Archimedes' screw. Should it turn out hereafter that the subject matter of this patent is no improvement, one thing we think is certain, viz. that it is perfectly safe from infringement!

Errata.—Page 423, first column, 27th line from top, for "7th July last," read "7th July, 1837."

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 902.] SATURDAY, NOVEMBER 21, 1840. [Price 3d.

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MASON'S IMPROVED COTTON WHIPPER.

Fig. 2.

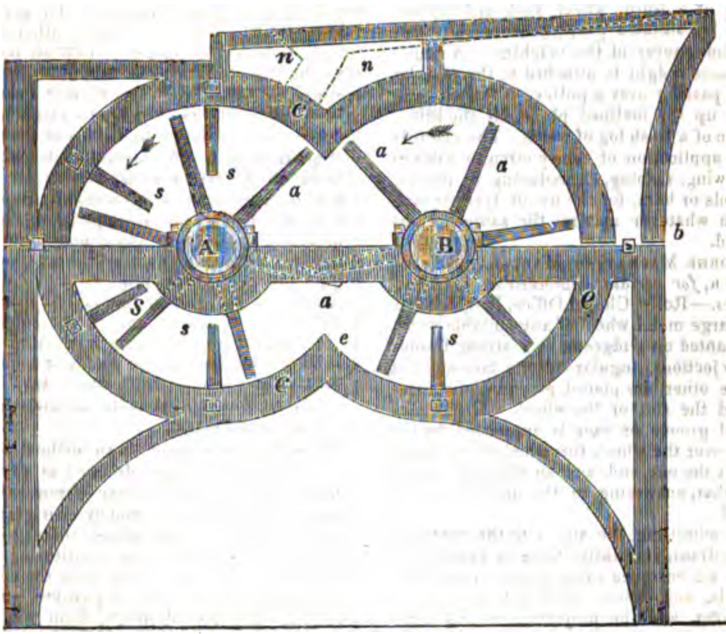
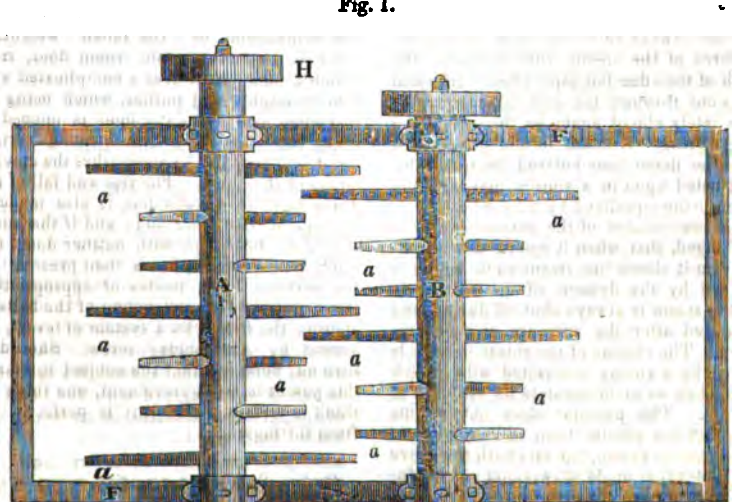


Fig. 1.



MASON'S IMPROVED COTTON WHIPPER.

We extract the following description of an improvement in the cotton whipper, recently introduced into the cotton factories in the United States, from a very interesting and highly useful work on "the Cotton Manufacture of the United States of America, contrasted and compared with that of Great Britain, by James Montgomery,"* a gentleman already favourably known by his works, on "the Theory and Practice of Cotton Spinning," and "the Cotton Spinners' Manual," which are deservedly in high repute among all persons engaged, or interested in, the cotton manufacture. Mr. Montgomery left Scotland in the beginning of 1836, intimately conversant with all the practical details of this manufacture, as followed in Great Britain; and he has since, as the superintendent of the York Factories in the State of Maine, had full opportunities of becoming acquainted with all the points of difference between the English and the American processes. The elucidation of these points of difference has been the principal object of the work before us; but it contains at the same time a large mass of useful and highly interesting matter connected with the rise, progress, and present state of the cotton manufacture throughout the United States—"the most formidable rivals with whom the British have to compete"—as well as statistical notices of the various manufacturing districts of those States, equally interesting to the manufacturer and to the general reader.

Description.

"Another modification of the whipper has been lately introduced: the writer has had one of them under his charge, and regards it as the best and simplest, as well as the cheapest machine of the kind he has yet known either in Great Britain or America. See fig. 1 and 2 on our first page. A B are two parallel shafts about 2½ inches diameter; *a a a a*, &c. are arms, or spikes, about 6 inches long, and fastened into the shafts. The shaft A is surrounded with a gird or harp from *c* to *c*, and the shaft B has a harp from *e* to *e*. The gird has several bars containing spikes pointed inwards; see *s s s s*. The front of the machine is open from *b* to *b*; all the other parts of it are enclosed, except a small opening above, represented by the dotted lines *n n*: this opening is about 2½ inches, extending across the top, by which the cotton is introduced, when the revolving arms of shaft A immediately take hold of it and carry it rapidly round, and it is thus agitated and torn against the spikes *s s s*; but as it proceeds round with the arms of the shaft A, it is met by the arms of the shaft B, which clear it off, and throw it out by the mouth *b b*. The belt pullies G H are of different diameters, so as to make the shaft B revolve faster than A, by which means it has more power, and frees itself more perfectly of the cotton that becomes entangled between the arms of the revolving shafts. The diameter of the pulley G is 6, and H 7 inches, or the driving drum may be of different diameters, to effect the same variation in the speed of the shafts. The speed of the shaft B ought to be 1800 revolutions per minute, and A 1600; and as the shaft A has to carry round the greatest weight of cotton, it is generally rather stronger than B.

"As the chief use of the willow is to open or separate the clotted tufts of cotton, so as to make it spread at the following machine; the tearing process it must pass through to accomplish this is very liable to injure and break the tender staples; therefore every machine that has been employed for this purpose, is liable to many objections. The writer has been acquainted with almost all the different machines that have been in *general* use for the last thirty years, and he considers the whipper, represented in the annexed representation, as decidedly the best which he has seen. It is called Mason's Whipper, from the name of the inventor, and though of small dimensions, being only 3 feet high, and 2½ broad, it is capable of willowing one bale of upwards of 400 lbs. in an hour and a half. It occupies little room; is easily managed and kept in order, and costs 75 dollars = £15 15*s*. 6*d*.

* Glasgow, John Niven, jun., London: Whittaker and Co., pp. 219.

ON THE COMPARATIVE MERITS OF PADDLE WHEELS AND SCREW PROPELLERS. REPLY BY MR. HOLEBROOK TO MR. PHILLIPS.

[Concluded from page 471.]

An attempt is next made by Mr. Phillips to prove that, by the employment of paddle-wheels, of 12 feet in diameter, the *Archimedes* could not possibly have gone more than 7.4 miles per hour. From the way in which, accidentally, the quotation is made by Mr. Phillips, it might appear to some of your readers that *I* had fixed this measure for the paddle-wheels, and, therefore, that, by so doing, I had proved myself wrong; but, I beg it to be distinctly understood, that this measure was given, not by me, but by Lieut. Claxton, in his testimonial, and, Mr. Phillips has very clearly shown, that it was not the right diameter; the proper one, in order to allow the screw and the paddle-wheel to propel the *Archimedes*, at the same rate if these instruments had moved in a solid, it is clear, should have been 14.3 feet; by adopting which measure, all superiority of the screw over the paddle-wheel, in giving speed to the vessel would have, by Mr. Phillips's mode of calculation, disappeared. By giving further increase of diameter to the paddle-wheel than that I have just given, the paddle-wheel would, according to Mr. Phillips's mode of estimating the propelling power of the wheel and screw, have become superior to the screw; and, in fact, this superiority might, if Mr. Phillips's ideas were correct, be further and further increased, until practical purposes would prevent the wheel from being made larger; but, it is clear, that the power of a wheel must depend upon many more circumstances than the solitary one of its diameter; and, therefore, that this attempt, made by Mr. Phillips, to give a superiority to the screw over the paddle-wheel, founded, as it is, upon erroneous assumptions, entirely fails.

Better acquainted, no doubt, as Mr. Phillips is, with the ricochet practice than I am, he does not appear to understand my method of reaching a screw propeller. Instead of placing a gun at a high elevation above the sea, and depressing its muzzle, it seems to me only necessary that the gun should be in an usual place on deck, and that its muzzle should be elevated, as in howitzer practice: then, by apportioning the charge to the effect to be produced, the ball would be rather pitched, than projected, as it is in common gun practice, and, entering the water, its direction would be changed, in a manner similar to that in which the direction of a ray of light is changed, when it enters the water after having passed through the air; and thus it would reach the propeller: and, when we consider that the blow, of a ball, which would be perfectly harmless against the thick immersed sides of a ship, would be utterly destructive of a piece of machinery such as the screw-propeller, I think I was not exactly presuming, when I urged that the screw-propeller was not entirely secure from shot. And any one, who will take the trouble to read carefully what I wrote, will not attribute to me any idea of setting up my knowledge of the principles of gunnery against the professional skill of Captain Chappell; but will see that my observations were intended as suggestions to remove oversight, rather than to impugn the better capability of judging, on the subject, of Captain Chappell over myself. But while I am on this point, I would ask Mr. Phillips who it is that teaches the principles of gunnery? Is it the naval officer or the civilian? And is not the profession of a military engineer rather of a mental than of a practical cast? Besides, is no one but a practical sailor to know any thing of the common properties of matter, whether it be water or metal? I rather think that Mr. Phillips would have served the screw-propeller better, in having proved me to be wrong in my ideas, than in intrenching himself under cover of mere epithets addressed to prejudice. I am as willing as Mr. Phillips to concur generally in receiving the opinion of a professional, in preference to that of an unprofessional, man; for the reason that, generally speaking, the observations of unprofessional men are untenable, and only due to utter ignorance of the subject upon which they are made; but, on the other hand, it is also possible that an unprofessional person may sometimes throw a new light upon a subject by an observation which may be improved upon, and made valuable by the professional man. I must say, I think

Mr. Phillips was in some measure imprudent in broaching the idea of interested motives; for his arms might be turned against his friends, were it worth the while. I may remark, besides, that it is rather cruel also, in one of the great leviathans of the deep, to taunt "the small fry" with their designation; conscious as Mr. Phillips is of his superiority, he might in mercy have reposed in the quietude of his innate strength.

I know not whether in the flattering account of the progress of the screw-propeller which Mr. Phillips gives, he speaks from hearsay or not; for, if from rumour, it is a curious commentary upon his observations, that the *Archimedes*, having been now sometime advertised for sale, being fitted with the screw-propeller, and ready to hand, is, at this very moment, lying unemployed, without a sail upon her spars, in the East India Dock, at Blackwall.

A word or two upon the good taste of comparing, even by inference, the patentee of the Archimedean screw-propeller with the immortal Watt. "Save me from my friends" is an adage to which Mr. Phillips has given new force. What, I would ask, has this patentee really done with the screw, in the way of making it available for propelling purposes? Why, people would suppose that he had first applied it as a propeller, or, at least, that he had given it the best form; and yet what really is the case? It appears, from the description of this propeller, given in No. 830 of this Magazine, that this gentleman, from want of previous information of what had been done by others before him, actually took out letters patent, claiming the application of the screw generally to propelling purposes; but afterwards finding that his patent was not valid, he disclaimed everything but the exact arrangement which is described in the Number of the Magazine to which I have alluded. If the opinions I entertain upon the subject be correct, he has chosen almost as bad an adaptation of the principle as any one could adopt; and it is to Captain Ericsson that the credit belongs of having made the most complete and accurate adaptation of the principle, a description of which may be found in your 721st Number; and yet I am not aware that even this plan is at present in use. A screw-propeller, such as the Archimedean, may be found in the old edition of "Tredgold," published many years since, —the only difference consisting in a greater length and less diameter of the screw in one case than in the other. In fact, there does not seem to be due to Mr. Smith more credit than that he may take for placing the screw in the very particular position in the dead-wood of the vessel which he has chosen, for many have before placed the screw at the stern of a vessel; and even this position, it is now found, according to Mr. Phillips's communication, and also almost agreeably to what I said in page 300 of No. 893, that using Mr. Phillips's own words, "several able ship-builders have already submitted plans to Captain Chappell for obviating this objection, and, being a mere mechanical difficulty, it will probably be overcome."

When that which I have now stated is considered, it does not appear that Mr. Smith can by any means be inferentially considered to be entitled to take a place by the side of such a being as Watt. But it must be confessed that this gentleman is endowed with an amazing amount of perseverance, which, not being damped by a perfect acquaintance with the difficulties he had to surmount, has enabled him to have procured the most extensive trial for the screw as a propeller, which the principle has ever yet obtained. He, besides, has been assisted in the most remarkable manner by the public press; this, with but one or two exceptions, having seemed to endeavour to outvie each other in the aid they should give in extolling this application of the screw. The small talkers of society, these being always taken with anything which to them has the appearance of novelty and strangeness, have done as much as in them lay to laud the plan of Mr. Smith beyond almost all rational bounds. Were it possible that this plan should be eventually demonstrated to be useful, I should hold it an act of injustice to Mr. Smith to carp at his not being exactly the original proposer of the plan; for abortive attempts by predecessors to prove the utility of a really good plan, I consider ought not to militate against the validity of a patent held by a successful introducer.

But, unfortunately for the Archimedean screw-propeller, the principle upon which it is founded, is under the ban of the re-

corded and well-proved laws of mechanical and hydrostatical science; and, until such laws shall be proved to be unfounded, a screw-propeller, whatever be the adaptation of the principle, whether the Archimedean; whether that by the adoption of blades, reaching from the axis to the circumference; or whether that, by the application of vanes at the outer parts of the instrument alone; though it may be considered a mere propelling apparatus, must, nevertheless, be stamped with the designation of an uneconomical and imperfect mechanical contrivance.

Finally, I am not aware, that in having endeavoured to counteract the erroneous, as I think, impressions likely to be produced by "The Report of Captain Chappell," I have at all deviated from a line of strick courtesy; if I have done so, it has been perfectly unintentional on my part, and I would offer every apology for any error of this kind; but, by the same right, by which Captain Chappell could publish his opinions and those of others upon the efficacy of the *Archimedean* screw-propeller, I thought and think myself justified in coming forward with my own opinions having a contrary tendency, and I did not, I believe, confine my communication to mere assertion, but it was almost a strict investigation: no part was not demonstrated before another was entered upon; and I am rather pleased than otherwise with Mr. Phillips's remarks; because, out of so many objections which I urged against the performances of the *Archimedean* screw-propeller, he has thought proper only to attack so few. For my part, I begin to tire of the subject, and, by this time, I think, will most of your readers: sufficient has now been said both for and against this screw-propeller, and the result may, I imagine, be safely left with time.

With every apology for trespassing at this length upon your valuable pages,

I beg to subscribe myself, Sir, your most obedient servant,

J. P. Holebbrook.

168, Devonshire-place, Edgeware Road,
Oct. 27, 1840.

RAILWAY TRAIN RETARDERS.

Sir,—Some of the railway accidents which have of late been so frequent, might have been avoided had the engineer had the power of stopping the train in a shorter space.

It appears to me, that at present, the only means of stopping the train are—reversing the engine and applying the brake to the wheels of the tender and one or two of the carriages.

It may happen, that in fact the only means really applied may be reversing the engines and applying the brake to the wheels of the tender, for the engineer and stoker from their position may perceive danger of the existence of which the persons having charge of the carriage brakes may be wholly ignorant until it is too late. I would therefore suggest, that the engineer (or stoker) should have the power of applying the brake to every carriage in the train, as well as the tender by the following, or some better arrangement:—

In the place of the levers pressing the iron friction bands tightly on the periphery of the wheels, let powerful springs be employed to press down the bands. This pressure must of course be taken off the wheels previous to starting the engine, by means of a lever of such form, that after the centre has been passed, the pull of the springs themselves will prevent the lever returning, unless the lever be made to repass the centre by some other force. The force to do this may easily be applied by the engineer or stoker by means of a chain running under and attached to the levers of each carriage, so that when danger threatens, the brakes may be applied to all the carriages in two or three seconds by drawing the levers over their centres, and thus allowing the springs to produce a constant and powerful pressure until the danger being over, the levers may be returned to their places until again wanted.

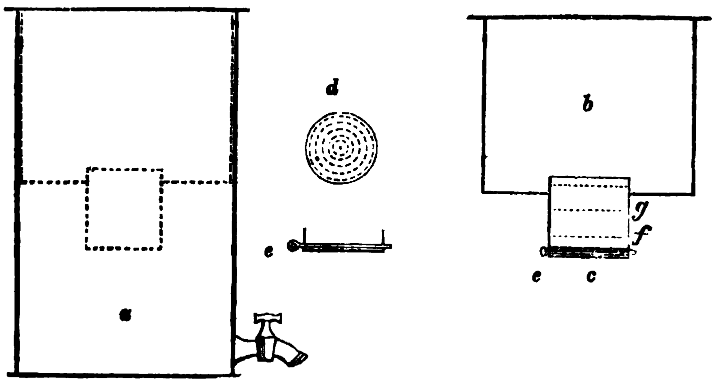
All this may be done without preventing the free use of the brakes as at present, at a very moderate expense, and without employing any more persons than are at present attached to each train.

I therefore hope this will meet attention in the proper quarter.

I am, Sir, your
Obedient servant and subscriber,
Henry Chany.

Clifton-street, Finsbury-square,
October 27, 1840.

SIMPLE AND EFFECTUAL WATER FILTER.



Sir,—Every person who has once enjoyed the benefits of good filtered water, is desirous of possessing a good filterer, and having procured one of the many excellent ones continually advertised, is delighted with his purchase, until having a glass of turbid water presented to him, he learns to his chagrin, that it has not passed through the filterer, which is "out of order," and though the sponge has been repeatedly cleansed, "it will not act." The cause of this failure is carefully concealed from view, and to the manufacturer the filterer must go to be "put to rights." I am therefore induced to send you the following description of a filterer I had made about five years ago, and if five years test is any recommendation, I can safely say that it works as well now as the first day it was made. I need only add, that it is cheaper than any one I have ever seen, of equal capacity, and may be made by any tin or zinc plate worker.

a, the outer case, is a plain cylindrical vessel, of slight zinc plate, 18 inches deep, 10 inches diameter, with cock soldered as near the bottom as convenient; *b*, the inner case, 9 inches deep, having the rim turned out to lodge upon the edge of the outer case; *c*, a smaller cylinder, 6 inches deep, 5 inches diameter, open at both ends, soldered into the bottom of *b*, but projecting half an inch above it. A cap *d* perforated with holes made by a fine ⅛th of an inch chisel fits on the bottom of *c*, and is retained in its place by a wire pin *e*. The small cylinder *c* is then filled up to *f* 2 inches, with granulated charcoal, from which all the dust must be carefully washed; from *f* to *g* 2 inches, with drift sand (also washed) and the remaining space sunk in a good close sponge. The whole is then closed by another perforated cap similar to *d*, and the filterer is complete. The caps should be perforated from the inside.

The top cap should be taken off about once a fortnight, and with the sponge and the cylinder *b* round *c* raised and thoroughly cleansed; occasionally about 1 inch in depth of the sand should be removed with a spoon, washed, and replaced, and perhaps once in a year the cap *d* should be removed, the whole contents of *c* dropped into a basin and thoroughly washed (the charcoal and sand are easily separated by their respective gravities.) If a small quantity of the sand and charcoal intermingle it will be of no consequence to the action of the filterer.

If I have been somewhat prolix in my description, it is only that any individual wanting a good serviceable filterer may be able to give the necessary orders to his zinc-plate worker.

I am, your obedient servant and constant reader, a

Lover of Pure Water.

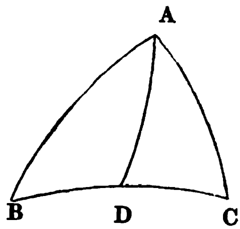
Woolwich, October 5, 1840.

QUESTION IN SPHERICAL TRIGONOMETRY.

Sir,—In solving an astronomical problem some time ago, I had to find the length of a great circle drawn from A to bisect B C in D. I discovered a very simple method of doing so, and as it is new, as far as I know, you will perhaps consider it worthy of a place in your useful journal. I am, Sir, yours, &c.,

GEORGE SCOTT.

October 19, 1840.



Formula for finding A D, the three sides of the triangle being given—

$$\text{Cos. } A D = \text{cos. } \left(\frac{A B + A C}{2}\right). \text{ Cos. } \left(\frac{A B - A C}{2}\right). \text{ Sec. } B D.$$

Demonstration.

By spherics $\text{cos. } A D B = \dfrac{\text{cos. } A B - \text{cos. } A D, \text{ cos. } B D}{\text{sin. } A D, \text{ sin. } B D}$;

also, $\text{cos. } A D C = \dfrac{\text{cos. } A C - \text{cos. } A D. \text{ cos. } D C}{\text{sin. } A D. \text{ sin. } D C}$;

then, if one of the angles, as A D B be obtuse, the other, A D C will be acute; hence, $\dfrac{\text{cos. } A D. \text{ cos. } B D - \text{cos. } A B}{\text{sin. } A D. \text{ sin. } B D} = \dfrac{\text{cos. } A C - \text{cos. } A D. \text{ cos. } D C}{\text{sin. } A D. \text{ sin. } D C.} \therefore 2 \text{ cos. } A D. \text{ cos. } D C = \text{cos. } A B + \text{cos. } A C = 2 \text{ cos. } \left(\frac{A B + A C}{2}\right). \text{ Cos. } \left(\frac{A B - A C}{2}\right)$;

that is, $\text{cos. } A D = \text{cos. } \left(\frac{A B + A C}{2}\right). \text{ Cos. } \left(\frac{A B - A C}{2}\right). \text{ sec. } B D.$

Q. E. D.

SYMINGTON'S SYSTEM OF CONDENSATION.

Sir,—The letter of your intelligent correspondent, "Scalpel" in your last number affords me much satisfaction, as it proves that the merits of the invention, known as *Symington's Method of Condensation* are beginning to be properly appreciated.

Having been one of those interested in bringing forward the invention, I beg leave to assure him that he is in error in saying that we ever had the "bad taste" to attempt to cram it down the throat of "A Public Company," for, we always acted with a delicacy and generosity to that company, of which they proved themselves but little deserving.

Perfectly prepared to substantiate what I have now advanced, I shall at my earliest leisure forward to you for the perusal of "Scalpel" the facts of the case, feeling satisfied that they have only to be examined to show that in doing justice to the invention, he has not done full justice to the conduct of those to whom it belongs.

I am, Sir, your obedient servant,

ROBERT BOWIE.

44, Burr-street, November 10, 1840.

THE "FATHER THAMES."

Sir,—In noticing "A Subscriber's" communication in your last Number, I beg to inform him that the 26th of September last, was one of the days on which the *Father Thames* beat the *Eclipse*, and of which I was an eye witness. All the dimensions of the *Father Thames* have been given both by "A Subscriber" himself, and by "Candidus," so that it is needless to repeat them here. All that remains to be mentioned is, that she has a *fan* for encreasing the draught, as it is a *tubular* boiler. I have also "taken another trip" to Gravesend, but I am still unable to discover the great *vibration* complained of by "A Subscriber." The "rattling of the funnel" did not proceed solely from the arms (which are exceedingly long and slim, and consequently, very pliable,) striking the sides, but the steam chest cover is, or was not, in a state of completion, and "A Subscriber" might have found a foot or more in two or three places without a single rivet. I imagine the reason the captain has orders to *stop* when the *Eclipse* "comes alongside," is that the owners of *Father Thames* have too much respect for the lives of their passengers, to risk running their boat alongside a high pressure one. Also, that *two* engineers being employed, arises from the peculiar construction of the engines; the hand gear is necessarily far apart, and it requires some little exertion to work it. But for my part, I cannot understand that one engineer, or two, or twenty, can possibly have anything to do with the speed of the boat.

I am, Sir, your obedient servant,

T. D. S.

October 28, 1840.

Fig. 1.

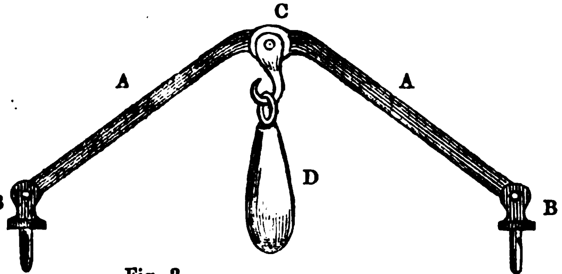


Fig. 2.

Fig. 3.

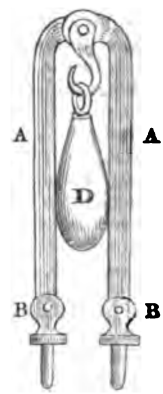


Fig. 4.

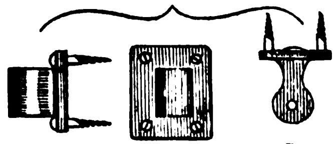
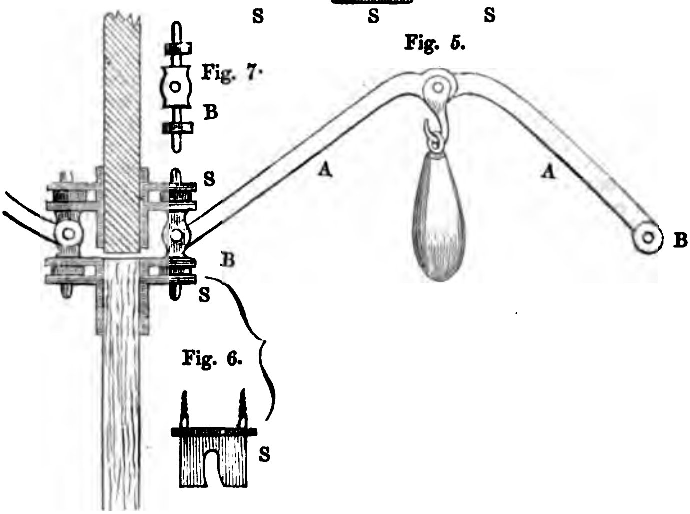


Fig. 5.

Fig. 7.

Fig. 6.



Sir,—I beg to hand you a description of the Russian door closer which is well worthy your attention : it has been above two years in use here pretty generally.

Hitherto it has only been applied to doors opening one way, and in its usual form consists of two jointed legs A A, (fig. 1, 2 and 3) having a compass joint at C, and similar ones in the heads of the studs B B; from the joint C, a weight hangs, the effect of which is to push the studs B B outwards.

Socket plates (represented in three views, fig. 4,) being fixed to the door, and to a corresponding plan on a wall, or on a stay projecting from one, the stud pins of B B being put into the socket holes, it is evident, that if the door be opened, the studs will approach one another until the apparatus assume the position of fig. 3, when the weight will cease to act, and the door will remain open, but if the apparatus be so adjusted, that when the door is fully open the legs shall not be quite parallel, it will begin to close again the moment it is let go, and the more obtuse the angle at C is made to be, the greater will be the power

of the apparatus to maintain the door in its shut position.

To apply this apparatus to a door opening either way, some change is required. In the first place, a pair of the jointed legs and a weight will be required on each side of the door, and the apparatus must be elevated to the level of the lintel, as shown at fig. 5, the socket plate, fig. 4, will still answer for the attachments to the walls, but the extremity, which acts on the door, must take the form shown at B, fig. 5 and 7, and the socket plates S, must be similar to that shown at S, fig. 5 and 6, and instead of a hole for the stud, as in fig. 4, there must be cuts, as in fig. 6, the sides of which should be arcs of circles, of which the hinge of the door is the centre.

By this arrangement, when the door has been pushed by one portion of the apparatus into its shut position, the stud B (fig. 5), will have engaged itself in the socket plates on the lintel, and will be incapable of extending further, the door may however be pushed onwards against the pressure of the other portion of the apparatus, as the pin of B has no hold on S, when that is pushed away from it. This plan is certainly not so sightly in a private dwelling house as the concealed spring boxes; but in public places when the doors are constantly kept in motion, I apprehend it would be invaluable, as there is no part of it likely to show any sensible wear in a century.

The above description will, I trust, suffice to explain the principle of the apparatus, and every intelligent mechanic who may wish to apply it, will be able to devise the modifications in the form and adjustment of the parts which particular cases may render necessary.

I am, dear Sir, very truly yours,

K. H.

Edinburgh, November 1, 1840.

CAN OTHER METALS BE BLOWN AS WELL AS GLASS?

Sir,—Being of opinion, that in a proper atmosphere it would be practicable to blow other metals than glass, and that such a result would be of infinite value in mechanics; give me leave to ask of some of your ingenious correspondents, if they have ever heard of such an experiment in any country—and what sort of a furnace it would be proper to construct to try it, as well as the proper air d instrument to be employed in giving expansion to the melted metal—whether lead, copper, silver, or gold, or any admixture of them? I by no means think the result impossible, with a suitable apparatus, and if it can be accomplished, I foresee great advantages in its success to the arts.

Allow me therefore to place this suggestion in your useful repository of mechanical speculation. Although I am quite aware of the want of adhesiveness in the common metals to any solid body, however fluid they may be, and of the difficulty, on account of their ponderosity to expand them by common means; yet by bending the end of the blow-pipe into the form of a cup we might perhaps facillitate the operation.

I am, Sir,

Your obedient, humble servant,

George Cumberland, Sen.

Culver-street, Bristol, October 28, 1840.

ON THE COMPARATIVE ADVANTAGES OF BLACK AND WHITE PAINT.

Sir,—A paragraph copied from the Transactions of the Society of Arts, has appeared in several periodicals and newspapers within the last twelve months, asserting that *black* is the *worst* colour for painting wood work in the open air while a writer in the *Penny Cyclopædia* (Art. Painting) states that *black* is the *most durable*. Perhaps your noticing this, may induce some of your able correspondents to favour your readers with further information on the subject which is of considerable importance.

Yours respectfully,

J. W. D. James.

No. 7, Queen-street, Camden-Town, October 26, 1840.

The communication referred to by Mr. James, was made to the Society of Arts by Mr. W. Kennish, carpenter on board H.M.S. *Victory*, and for which he received the thanks of the Society in their Session for 1837-8. As this paper is one of considerable merit, relating to a subject of great practical importance, we have extracted it verbatim from the Society's Transactions for the information of our readers.

Remarks on the disadvantages that attend the use of Black Paint on board ship.

"There is nothing that will prove this evil more than by observing the black streaks of a ship after being in a tropical climate for any length of time. It will be found that the wood round the fastenings is in a state of

decay, while the white work is as sound as ever: the planks that are painted black will be found split in all directions, while the frequent necessity of caulking a ship in that situation likewise adds to the common destruction; and I am fully persuaded, that a piece of word painted white will be preserved from perishing as long again, if exposed to the weather, as a similar piece painted black, especially in a tropical climate.

"I have heard many men of considerable experience say, that black is good for nothing on wood, as it possesses no *body* to exclude the weather. This is indeed partly the case; but a far greater evil than this attends the use of black paint, which ought entirely to exclude its use on any work out of doors, viz.: its property of absorbing heat. A black unpolished surface is the greatest absorber and radiator of heat known; while a white surface, on the other hand, is a bad absorber and radiator of the same: consequently black paint is more pernicious to the wood than white. This may, and has been proved, by innumerable experiments; but the following simple experiment may perhaps be considered worthy of notice:—Take four pieces of tin plate and place them together in pairs, having the inner surface smeared with lard so that they may adhere together; then colour one pair black, leaving the other white, and suspend them equidistant from a small iron ball made red hot: it will be found that the black surface presented to the ball absorbs the heat, and soon gets charged sufficiently to melt the lard, and the result is that the two plates immediately separate; on the other hand, the white remains firm, as the rays from the heated body are for the most part reflected by the white surface.

"The foregoing experiment plainly shows, that wood having a black surface will imbibe considerably more heat in the same temperature of climate than if that surface was white; from which circumstance we may easily conclude, that the pores of wood of any nature will have a tendency to expand, and rend in all directions, when exposed under such circumstances,—the water of course being admitted, causes a gradual and progressive decay, which must be imperceptibly increasing from every change of weather. The remedy to so great an evil is particularly simple; viz.: by using white, instead of black paint, which not only forms a better surface, but is a preventive to the action of heat, and is more impervious to moisture. The saving of expense would also be immense, and I am convinced that men of practical experience will bear me out in my assertion.

"Two striking circumstances, which have fallen under my own immediate notice, deserve mention. The first was the state of H. M. Sloop *Ringdove*, condemned by survey at Halifax, N.S., in the year 1828.

"This brig had been on the West India station for many years. On her being found defective, and a survey called, the report was to the effect that the wood round all the fastenings was totally decayed in the wake of the black, while that in the wake of the white was as sound as ever; a striking proof of the different effect of the two colours.

"The next instance I shall mention relates to H. M. ship *Excellent*, of 98 guns (formerly the Boyne.)

"This ship is moored east and west, by bow and stern moorings; consequently, the starboard side is always exposed to the effects of the sun, both in summer and winter. In this situation her sides were painted in the usual manner of a ship of war; viz.: black and white, of which by far the greater part is black; this latter portion on the starboard side I found it impossible to keep tight; for, as often as one leak was apparently stopped, another broke out, and thus baffled the skill of all interested. In the meantime, the side not exposed to the rays of the sun remained perfectly sound. I then suggested to Mr. Kennaway (the master-caulker of her Majesty's dockyard at Portsmouth), who had previously given the subject consideration, the advantage likely to be derived from altering the colour of the ship's side from black to white. Captain Hastings having approved of the alteration, the ship was painted a light drab colour where it was black before, upon which the leaks ceased, and she has now continued perfectly tight for more than twelve months; and, indeed, I can confidently state, that the ship will last as long again in her present situation, as she had begun to shrink and split to an astonishing extent when the outside surface was black, and had which entirely ceased since the colour was altered.

"Instances of the injurious effects of black paint on shipping generally, also on the masts, yards, boats, &c., are of daily occurrence, and decidedly point out the benefit likely to result from the substitution of the one colour for the other, and manifest advantage to be derived from its use by the maritime interest, though I am aware some may object to its use as not being ship-shape To such I have only to state, that the application of copper to ship's bottoms, and the use of chain for cables, have already met with the same foolish objection at the time of their introduction, since which period thousands of valuable lives, with property to a large amount, have been saved by their instrumentality."

QUESTIONS IN PLASTER CASTING.

Sir,—I have not addressed you until I found the information I am in search of, unattainable by any other means in my power.

I should therefore be much gratified by being informed through the medium of your Magazine, of the best materials for constructing moulds; so as to obtain fine impressions from bas-reliefs in plaster of Paris without injury to the colour or texture of the originals; and, whether the plaster needs any previous treatment, and, if so, of what kind?

If any thing being added to the plaster will harden it and render it capable of taking a finer impression than is usual?

What moulds are necessary to the casting of wax; and the preparation they may require previous to casting from them. I may perhaps venture to express a hope that the information I have requested may, by being widely diffused, be of use to many in the same circumstances with,

Your obedient servant,

J. R.

NEW PUBLICATIONS.

Instructions for the Multiplication of Works in Metal by Voltaic Electricity. By THOMAS SPENCER. 8vo. pp. 62. Glasgow, Griffin and Co.; London, Tegg.

The New Art, the practice of which it is the purpose of these "Instructions" to facilitate and promote, is beyond all question the most valuable contribution which Science has made to the Workshop in modern times; and no less certain it is that to Thomas Spencer, the ingenious and hardworking tradesman of Liverpool, and none other, the world are indebted for its discovery. The rival claim set up by Professor Jacobi, of St. Petersburgh, has always appeared to us so utterly groundless, that we have observed with astonishment and disgust the countenance which it has received from the higher scientific classes of this country. It is not only not true, that Jacobi suggested before Mr. Spencer the application to workshop purposes of the long well-known scientific fact, that a voltaic current passed through metallic solutions will precipitate the metal contained in them; but it is evident, from the extreme want of practical knowledge and skill displayed in all that has emanated from the Professor, that such a suggestion was quite beyond the range of any shot in *his battery*. Where in all that he has ever put forth on the subject *before the appearance of Mr. Spencer's papers* shall we find evidence of his knowledge of the simple yet most essential fact, that the precipitate takes place in a solid and homogeneous—not friable or brittle—state? We venture to say, that up to the disclosure of Mr. Spencer's successful experiments on this point, neither the *Professor* (most appropriate phrase), nor any of those who now so disgracefully uphold his pretensions, to the injury of a countryman of their own—of whom any country might be proud—had the remotest idea that such would be the case. If he or they, or any of them had, let us see the proofs.

With equal truth and modesty Mr. Spencer observes, in the Preface to the Treatise before us—

"Few who watch the progress of events can doubt, that had this discovery not been made at this present period, a very brief additional time would have brought it under public attention. Scientific facts were all tending toward it. The great discoveries of the last age were being condensed and combined into the elements of learning for this. Trains of scientific thought which had been long and curiously laid, only required the aid of the match to explode them simultaneously."

Granted that Mr. Spencer only furnished "the match" which produced the explosion —the happy thought which brought to instant fruition many long years of speculative contemplation—who shall say that he is on that account the less deserving of honour and reward? What have all our most valuable discoveries and inventions been but happy thoughts—but matches suddenly applied to long preexisting trains?

Of the great value of the Art, and of the wonderful rapidity with which our mechanics are everywhere turning it to account, we shall leave the Author of it himself to speak.

"There are few branches of manufactures in any way connected with art, that will not benefit by the adoption of this principle. Already it is in active operation among calico printers. Potters can now afford to pay for the highest art to design and engrave one plate, as they may have any number of duplicates equal to the original, at little more expense than the price of the copper. The copper matrix for type founding, however elaborate, may now be produced with the greatest facility, and at a trifling expense.

"Wood engravings may now be copied in copper to any extent, and the finer lines which could not be obtained in the original, may be put into the copper fac-similies with facility. Even in stereotyping it may ultimately be found as economical as the method in common use, and certainly much better.

"Elegant designs are deposited on plates in relief, from which embossed cards are printed; in short, there is scarcely a department connected with the elegancies and refinements of life, where I do not hear of its application; and since I discovered an efficient method of

metallizing the surface of non-metallic substances, even a copper statue may be taken from a plaster of paris mould, in little more time than would be required to deposit the same thickness on a medal."

Mr. Spencer did not patent his discovery, but made at once a free gift of it to his country and the world. Had he patented it, he could not have failed to realize an enormous fortune.

Shame will it be to England if Mr. Spencer is any loser by his liberality. Great are his claims upon it, not only for what he has done, but for what—if enabled to pursue the bent of his genius—he is yet *capable* of doing. Mr. Spencer does not conceal that his "means of cultivating science are limited, the hours it occupies being stolen from those usually set apart for relaxation and rest, *my ordinary avocations being of a laborious nature.*" Millions are now in the course of being lavished on the arts of war, which are arts of destruction and waste. A grant of a few thousands to so successful a contributor to the arts of peace as Mr. Spencer would garland the way, by which the losses of many wars might be repaired.

May not besides, society as it exists in England, owe something to Mr. Spencer in the way of reparation for gross injustice? Is it unlikely that he may have been prevented from securing to himself the benefit of his discovery for the usual patent-right period of fourteen years, by the shamefully enormous cost of a patent? Nay, is it not almost certain, that if he could have secured for fourteen or even any lesser period a right to his discovery, as easy and effectually as he has secured to himself and his assigns a right for his lifetime to the book of "Instructions" now before us, he would have done so? And what claim to public protection can the Author of a *description* of a new art set up, which is at all to be compared with the claim of the *inventor* of the art itself? Mr. Spencer is, we doubt not, but one of many inventors who have been literally defrauded of the fruits of their genius and industry by a most anomalous—most unfair—and most unwise system of legislation.

The cause of the preference given to the empty pretensions of Jacobi in the higher scientific circles of this country is no secret. A common carver and gilder (for Mr. Spencer claims to be nothing more), proposed in the autumn of 1839 to disclose the New Art of which we are now speaking to the Birmingham meeting of the British Association; and had he been allowed to do so, he would have conferred, by his communication, more honour and value on the proceedings of that Association than all besides that it has ever achieved for the arts and sciences since its first existence. But the Association missed the opportunity! The section (of its Wisdom?) to which the proposition was referred, and of which the mouth piece for the season was Dr. Lardner, decided that the communication of the carver and gilder was undeserving of notice! It was positively refused a hearing!!! It seemed absolutely as if they thought nothing worth while, could come from any quarter so lowly and so unpretending! Yet, in spite of the *rejection* by the British Association of the proffered revelation of this important art—in spite of their contumelious treatment of its meritorious discoverer—the art has made its way, and has achieved triumphs which sweep all opposition and all disparagement before it. And therefore do the magnates of the scientific world feel annoyed—irritated—mortified—to the odious degree even of denying the humble carver and gilder any merit whatever! Rather than confess themselves to have been egregiously in the wrong—to have missed an opportunity of exaltation—such as they never had before, and such as may never happen to them again—they would rather transfer to a foreigner of the shallowest pretensions imaginable, all the credit, which is justly and exclusively due to a countryman of their own of the highest genius and attainments!

The Art has been hitherto called *Electrotype;* but Mr. Spencer proposes to give it the name of ELECTROGRAPHY; and we quite agree with our able contemporary, the *Liverpool Journal*, in recognising the right of the first discoverer to designate it as he pleases. Electrography is, besides, the fitter appellation of the two; being at once more distinctive and more comprehensive.

Specifications of Practical Architecture; preceded by an Essay on the Decline of Excellence in the Structure and in the Science of Modern English Buildings, with the Proposal of Remedies for those defects. By ALFRED BARTHOLOMEW, Architect. 8vo. pp. 772, with 160 wood engravings. London, Williams.

The title of this work conveys but an imperfect notice of its contents. The "Essay" which precedes the Specifications occupies above one half of the entire volume, and consists of no less than one hundred and fourteen chapters, which treat not only of the immediate causes of the decline of modern English architecture, but of almost every subject connected with architectural art. Mr. Bartholomew is an enthusiastic lover of his profession, and has studied it well and thoroughly; he has been a shrewd and careful observer; likes to think for himself, and thinks generally very justly; and he has accumulated, in the course of a long and successful practice, a vast deal of most valuable practical information—of all which

excellent qualifications for writing well, the fruit is to be found, in the many-chaptered and very able Essay before us. We have been especially pleased with, and would particularly recommend to the attention of the architectural student, those parts of Mr. Bartholomew's lucubrations in which he traces many of those peculiarities in ancient art, which hasty and uninformed observers are but too apt to regard as the offspring of mere whim and caprice, to a profound sense of utility, or what he calls pure structural taste. A brief quotation or two from his Preface will at once unfold to our readers the scope of Mr. B.'s views on this head.

"The Greeks, from the exercise of judgment, little assisted by their immature science, had their architraves high, massy, and expensive; *this was purely structural.*

"The Romans, having through the advance of science acquired the art of relieving by concealed arches their architraves from superincumbent weight, made these architraves lighter and less massive; *this too was purely structural.*

"A lighter burthen to support led of consequence to a reduction of the bulk of the column. * * *

"I am not less sure that the Pointed Architects having, by a refined philosophy, cut away burdensome crowns from arches, what remained of these materials became of necessity Pointed Arches, and constructively so, although their invention is imagined by the superficial to be merely an affair of taste.

"In Pointed Architecture all is structural, from the boss which confines the arch ribs (radiating from it as the spokes radiate from the nave of a wheel), to the wall buttress, which receives the endings of the vaulting most artfully conducted down the vaulted ribs through the flying buttress, and innoxiously dissipated on the ground itself * * * * * *

"In Pointed Architecture all is structural, from the brazen filleting, which sustains the detached shafts of the early English piers, to the mullions which sustain the glass of the windows, and prevent the storm from blowing it in.

"The modern man of taste would imitate the groined vaults of Pointed Architecture merely because they are groined; but the Freemason groined them because he would so relieve from thrust and weight the window-heads, voids, and other weak parts of a fabric. * * *

"The Freemason spread his rib-work as artfully, in proportion of lightness and tenacity, almost with the daring and success with which the spider spreads his web; while a large portion of modern rib-work is but a parasitical burthen upon vaulting scarcely able to sustain itself."

The Specifications, which are fifty-four in number, are all of the author's own composition, and no less than thirty-two of them are specifications of works which have been actually constructed according to them, under Mr. B.'s own superintendence,—without any "dubious or vulnerable parts" being discovered in them, or any "disputes" having arisen out of them between the builder and the contractors.

An Appendix of Forms is added, and an Alphabetical Abstract and Arrangement of the London Building Act drawn up with great professional tact and skill.

Tyas's National Map of England and Wales, No. 1. Tyas—Weale, Publishers; Jobbins, Engraver.

The National Map, the first number or sheet of which we have now before us, is to be throughout on a uniform scale of one-third of an inch to a mile (half the scale of the still unfinished Ordnance Map); the price of each sheet, however full of labour, is never to exceed one shilling, and many are to be charged only sixpence; and it is expected that the entire map, embracing fifty-eight sheets, will not cost more than fifty shillings. It is a well-planned and most meritorious undertaking, and can hardly fail of pre-eminent success. Nothing of the sort, at once so cheap and so complete, has ever before been offered to the public; and in point of execution (if we may judge from the specimen before us), it has nothing to fear from comparison even with the great and costly Ordnance Map itself. The present sheet comprises London and its environs, and is to be followed by Surrey, Kent, and Sussex.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM PEIRCE, OF JAMES'S PLACE, HOXTON, IRONMONGER, *for improvements in the construction of locks and keys.*—Enrolment Office, Nov. 2, 1840.

These locks, which are upon Barron's principle, with numerous tumblers, are furnished with a detector, consisting of a sliding bolt acted upon by any one or all of the tumblers; the opposite end of this sliding bolt is jointed to a small lever, mounted on a suitable axis. Within a tube, opposite the lower part of the key-hole, a dart, or sharp-edged punch is placed upon a strong spiral spring; there is a notch on the under side of the dart, in which the detector lever rests and holds the dart down upon the compressed spring. On attempting to open the lock with any but the original key, one or other of the tumblers is over lifted, which, acting on the detector lever, releases the dart or punch which flies out through the key-hole,

wounding the hand that holds the key. The face of the punch being in the form of a letter or figure, inflicts a wound that for several weeks identifies the agressor; these locks have therefore been termed *Identifying Detector Locks*, as noticed at page 314 of our 893rd number.

In ordet to prevent the accumulation of dirt, &c., within the pipe of the key, a metal stop is fitted so as to work freely within it, being kept flush with the end of the pipe by means of an internal spiral spring, which yields to the pin of the lock when in use.

The claim is,—1st, The mode of constructing detecting locks. 2nd, The mode of applying spring stops to keys.

Frank Hills, of Deptford, Manufacturing Chemist, *for certain improvements in the construction of steam boilers and engines, and of locomotive carriages.*—Enrolment Office, Nov. 5th, 1840.

These improvements are numerous and difficult to explain without the illustrative engravings; a tolerable idea of their nature, however, will be conveyed by the following list of the ten claims:—

1. The employment of a series of vertical tubes partly filled with water, and having small pipes passing down their centres, forming passages for smoke or heated air.

2. The employment of a series of vertical tubes which are closed and unconnected at the top, and open at the lower end, which communicates with a chamber, or series of chambers, partly filled with water; and which tubes have small pipes passing up their centres, for the purpose of conveying the steam to the boiler with which they are connected.

3. The use of flat chambers connected by means of pipes, filled with water, the upper portion of such chambers forming steam chambers.

4. The employment of wooden felloes to wheels used for locomotive and other carriages, which felloes are enclosed between two vertical wrought-iron rings, to which the spokes of the wheel are welded.

5. The employment of hollow arms, which are open at the ends on which the wheels revolve, and through which opening the driving shaft passes.

6. The employment of collars or enlarged pieces running in bearings, which have a groove and are connected with the brass containing oil, in order that a regular supply may be afforded to the working parts requiring the same.

7. The method of filling up the space between the arms of the (Hero's) engine.

8. The method of reversing the motion of the engine by employing two sets of arms, with other apparatus hereafter described.

9. The mode of inserting a wooden block or other slow conductor of heat between the tube which communicates the motion and the driving shaft.

10. The mode of imparting motion to an engine shaft, by means of an arm or crank being fixed on the middle of such shaft, and driven by one of two connecting rods alternately, which are both driven by the piston rod and guided by radius rods.

Henry Dircks, of Liverpool, Engineer, *for certain improvements in the construction of locomotive steam engines, and in wheels to be used on rail and other ways, parts of which improvements are applicable to steam engines generally.* — Rolls' Chapel Office, November 12th, 1840.

Mr. Dircks claims, first, a novel arrangement and construction of the exhaust or exit pipe by which the waste steam from the cylinders is conducted into the chimney, and is made to act upon the gas, smoke, or heated air at the back end of the fire tubes in very small jets, and thereby to prevent or consume the smoke from the furnace when coal is used. The exit pipe is placed in the smoke box of the engine as usual, but consists of a series of small branching tubes perforated with a number of small holes on the side opposite the fire tubes, so as to cause the waste steam to issue in jets against the ends of the tubes through which the smoke, &c., escapes, and thereby effects its destruction. The second part of this patent refers to the construction of cast or wrought iron wheels for railway purposes, with wood tyre, of which we gave a full description in our 896th number.

The claims are—1, the construction or arrangement of the exhaust or exit pipe, used in combination with tubular boilers, in the manner, and for the purposes set forth. 2, the construction of a metallic wheel with a wooden faced tyre, without being confined to its precise mode of construction or putting together.

Rice Harris, of Birmingham, Gentleman, *for certain improvements in cylinders, plates and blocks, used in printing and embossing.*—Roll's Chapel Office, Nov. 12, 1840.

This patent is,—1st, for the manufacture of cylinders, plates and blocks made of, or coated with glass, enamel, or other vitrified substances, containing silica, boracic acid, or either of them, sufficient to render such cylinders, &c., capable of being acted upon by hydrofluoric acid, alone or in combination with ammonia, or other base. The cylinders thus produced, being used for printing or embossing of linen, woollen, silk or other similar fabrics. 2nd, the application of tubes or linings for cylinders made of copper, brass, or other expensive materials, for the purpose of economising those metals. The glass cylinders, &c., are made in the follow-

ing manner: 28 parts (by weight) of clean Isle of Wight sand: 85 parts of red lead: 14 of soda ash: 7 of nitrate of soda: 7 of calcined iron scales: 7 of refined borax: 7 of calcined copper: 7 of oxide of manganese: and 20 parts of pulverised flint glass, are melted together in a large crucible or pot, in a glass furnace. When these ingredients have become fused, and the whole, or nearly the whole, of the volatile gas has been disengaged, the fluid mass is transferred to smaller pots for the convenience of casting. A cast-iron mould, in parts, is provided, its internal diameter being that of the cylinder required, and furnished with an inner core or tube, through which a current of cold water is continually flowing to prevent the fusion of the tube. When the melted glass is poured into the mould, a solid cylindrical piston is forced down upon it by a strong vertical screw, in order to compress and solidify the mass. The cylinder thus formed, is to be annealed in a kiln of the usual kind, by being placed in a case of iron rather larger than the cylinder itself, and surrounded with finely-powdered charcoal; this case is to be suspended within the kiln, so that the cylinder may be uniformly annealed all over. Or, the cylinder may be annealed in the mould in which it was cast. The cylinder is then to be smoothed and polished in the manner usually adopted in glass polishing.

Cylinders, plates, &c. may also be made of other materials, and coated externally with some suitable vitrified substance, capable of being acted upon in like manner by the acid. The cylinder, &c., produced in either of these modes, may be engraved upon the surface in the usual way of engraving glass, or may be etched by treatment with the acid; in the latter case, the parts not to be acted upon are protected by wax or other suitable etching grounds, and the cylinder immersed in hydro-fluoric acid; by this means the pattern, in relief for printing, or sunk if for embossing, is produced upon the surface, and the cylinder being mounted on a mandril or axis, is ready for use. In the formation of metal cylinders upon the plan here patented, tubes or linings of iron, or compressed wood, are put into cylinders of brass, copper, or other suitable metals, thereby reducing the quantity of the more expensive materials. The external brass or copper cylinder has a lining cemented throughout its length, furnished at each end with a screw projecting beyond the cylinder for receiving two caps or nuts, which attach it securely to the cylinder. A rib or feather upon the lining tube fits into a corresponding groove upon the axis or mandril, in the usual way of mounting printing cylinders.

GEORGE JOHN NEWBERY, OF CRIPPLEGATE BUILDINGS, MANUFACTURER, *for certain improvements in rendering silk, cotton, woollen, linen, and other fabrics, waterproof.*—Rolls' Chapel Office, Nov. 12th, 1840.

This process consists in the application of drying oils, oil compositions, varnishes, &c. in such a manner, that one side of the fabric, when finished, presents a nearly unaltered appearance, while the other is covered or coated with the composition employed. This is effected by applying siccative or drying oils and compositions, so as that while one surface is dried by any of the usual means, the drying of the other shall be retarded or prevented. Several methods of accomplishing this object are set forth. In the first place, the silk or other material being strained upon a frame is floated on the surface of any suitable siccative compound in a bath of about one quarter or half an inch in depth, when a thin skin or pellicle forms and dries upon the upper surface, while the lower one is prevented from drying by its immersion in the fluid. When this pellicle is quite dry, the silk is removed from the bath, and the oil cleared from its under surface by washing it with spirits of turpentine, which restores the original appearance of the fabric on that side, while the other side remains coated with the waterproof composition.

Another method is to lay the fabric saturated with the oil, &c. upon a slab of stone, slate, metal, or other non-absorbent surface, when a similar effect will be produced. In using oil or oil paints, the time required to form the pellicle depends on the nature of the composition, the state of the weather, &c.; in summer, ordinary boiled linseed oil takes about ten hours to skin over, but this must be ascertained by touching, the drying process being continued until the surface loses its tackiness—i. e., till the pellicle is perfectly formed.

Fabrics prepared with the water-proof compositions may be placed on both sides of horizontal tables; or, in order to economise room, the tables may be set to dry vertically, or at an angle: the composition in that case being thickened with whitening or pipe-clay, to prevent its running. Another plan is to place two pieces of silk, or other fabrics, on stretching-frames, saturate them with the composition, and leave them in close contact; when the pellicles on the exterior surfaces are dry, the two fabrics are to be separated, and the interior surfaces cleaned off with spirit of turpentine as before directed. Another mode is to saturate the fabrics singly, and scrape off the pellicle as it is formed on the one side, leaving it undisturbed on the other. Or, when the inspissated composition is just beginning to set, but is still capable of being washed off, a coat of plain linseed oil, thickened with flour or other suitable body, is laid carefully on

the one surface, while the other is left to dry; when the pellicle upon the unprotected side is hardened, the composition on the opposite surface is washed off with spirits of turpentine.

Another mode is, saturating the fabric with oil paint, that will not dry very readily without the addition of metallic oxides; as, for example, linseed oil. This oil, therefore, is to be thickened with proper pigments, and well brushed over the fabric; the oxide, in an impalpable powder, is then to be sifted over the one surface, which will cause it to dry, when the other can be cleaned off in the usual manner. Or lamp-black mixed with oil, to a buttery consistence, is to be unequally applied to the two surfaces, so that when the thin permanent coating is dry on the one side, the other, being still moist, can be easily removed.

Damask patterns or designs are produced with the compositions, by using plates or blocks in which the pattern is sunk or raised upon them after the manner of blocks for printing calicoes, paper-hangings, &c., which projections cause the drying to take place in the form of the pattern; the other parts of the outline remaining moist, are washed off with spirits of turpentine. Another modification for producing the same effect is by using perforated pattern-plates of card-board, hardened oil-cloth, or other suitable laminated materials, and placing the same against one side only of the fabric, or between two fabrics, on a frame, as before-mentioned. The claim is, first, for the improved modes above described of applying substances to such saturated textures so as to prevent one surface thereof from drying hard, or forming a pellicle thereon, while the other is allowed to do so, by the action of the atmosphere, or by artificial heat, and then cleaning away the moist parts by the agency of spirits of turpentine or other suitable liquid. Secondly, the mode of producing damask patterns or designs on the surface of such fabrics in the way or manner above stated.

RECENT AMERICAN PATENTS.

[Selections from Dr. Jones's List in the Journal of the Franklin Institute, for August, 1840.]

COFFINS MADE OF CEMENT, &c. *M. Leonard; July* 2, 1839.—The claim is to the making of coffins of a resinous cement which is to be poured into moulds properly constructed, there being cores of thin boards, perforated, or formed of slats, in such a manner as to cause the cement to bind perfectly, and also to cover the edges of the wood completely. The particular manner of forming these moulds is also claimed.

"My cement, or composition, I make as follows:—I take rosin, beeswax, and pulverised stone, which I incorporate intimately by heat. The stone may be limestone, marble, granite, or any other of a suitable hardness and texture; the pulverised stone I prefer to make of different degrees of fineness, from that of corn-meal to that of grains of buck-wheat. To five pounds of rosin and one of beeswax, I add about thirty pounds of the pulverised stone, first melting the rosin and beeswax in an iron vessel over a fire, and stirring in the pulverised stone, previously sifted; and these ingredients in their proportions, or nearly so, will constitute a cement, or bituminous artificial stone, which, whilst it may be fused and cast into moulds, will, when cold, be extremely hard and tough, and perfectly impervious to air and moisture."

GAS BURNERS. *G. Darracott and J. Nason; July* 26, 1839.—"The object of our improvements is to render the passages in the burner, through which the gas is conveyed for consumption, more accessible, that the carbonaceous matter which is liable to collect in and obstruct them, may be expeditiously removed."

The claim is to "the method of supplying the burner with gas through any number of straight perpendicular tubes, or apertures, opening into a circular space above, and into a common feeder or reservoir below, which feeder may be taken off at pleasure for the removal of any obstruction which may occur in the said tubes or apertures."

The cylindrical body of the burner has a screw cut on its lower end, by which it is screwed into a bottom or seat, which bottom screws on to the gas tube. Holes are drilled, in a vertical direction, between the openings in the cylindrical body of the burner, through which air is admitted to the interior flame, which holes lead into the annular space below the perforated steel plate for the jets. When this cylindrical body is unscrewed from its seat, any obstructing matter may be readily removed through the said straight holes. The circular space below the jet plate is cut from the solid metal, and the holes are drilled into it from below.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 903.] SATURDAY, NOVEMBER 28, 1840. [Price 3d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

TAYLOR'S IMPROVED STAVE-CUTTING MACHINE.

Fig. 1.

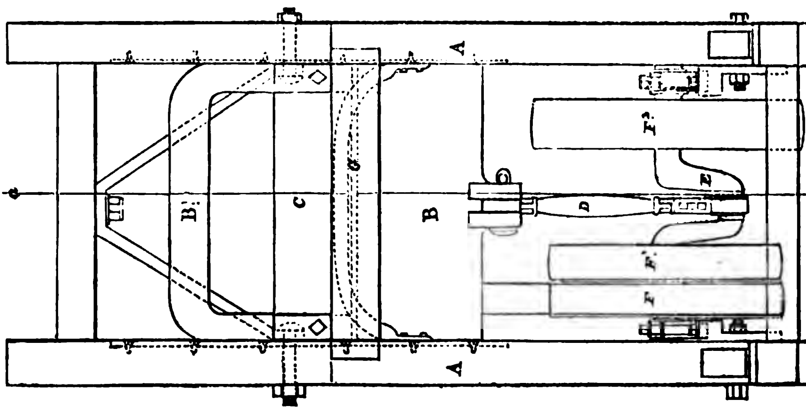
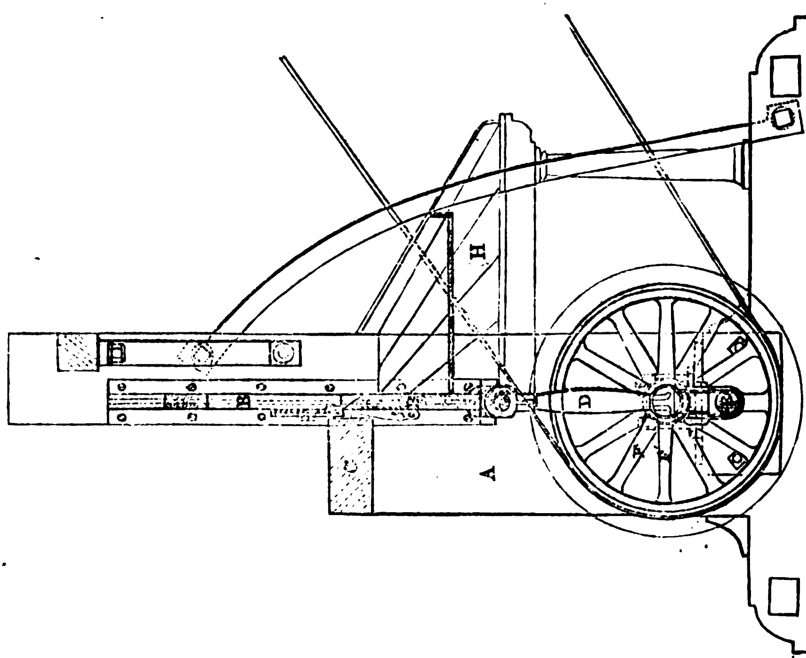


Fig. 2.



TAYLOR'S IMPROVEMENTS IN MANUFACTURING STAVES, SHINGLES AND LATHS.

Among the specifications of patents enrolled during the past week, is one by Mr. W. H. Taylor, for a method of forming the staves of casks, shingles and laths, which promises speedily to supersede all hand-work of this description.

The wood to be operated upon, is first steamed, until it acquires such softness and pliancy, that it can be cut or blocked by suitable machinery into the different forms required, with a degree of rapidity and precision, not hitherto attained.

After being sufficiently softened by the action of the steam, the wood is cut into straight rectangular pieces by an ingenious cutting machine shown in the engravings on our front page, fig. 1 being a front elevation, and fig 2, a lateral section through the line *a b*. A A, is the frame of the machine; B B, a strong iron plate, which slides up and down in grooves in the side posts of the frame; C is a straight knife, or cutter, affixed to the front of the sliding plate B, but at such a distance from it as shall correspond with the thickness required to be given to the pieces into which the blocks of wood are to be cut. D is a shaft which connects the bottom of the sliding plate B with the crank E. This shaft is connected by gearing F F¹ with a steam engine or other power, by which a rotary motion is given to the crank, and (through the crank) an alternating vertical motion to the sliding plate B and knife C. F is a fly-wheel; G a platform, on which the block to be cut is placed and pushed forward by hand against the plate B, and under the knife C. Upon each descent of the knife a piece of wood of the exact size determined upon, is sliced off the block, and falls down an inclined shelf H, into a suitable receptacle. After the pieces are thus cut off, if intended for barrel staves, they are forthwith removed to the forming and bending machines, so as to be finished while in the soft state; as it is essential to the perfection of the process that the wood should not be allowed to cool between any of the several operations.

This process, besides being one of great rapidity, is also one of great economy, the operations being conducted with much less waste of material than attends the usual modes of sawing, rending, chopping, adzing and planing. Its application appears to us to be very extensive, and exceedingly useful for all purposes similar to those enumerated by the ingenious patentee.

RAILWAY WHEELS WITH WOODEN TYRES.

"*Palmam qui meruit ferat.*"

Sir,—I perceive a notice in your very useful and valuable periodical, No. 899, disputing Mr. Dirck's priority to the invention of wooden tyre for railway wheels, and claiming it for a Mr. John Rivington, jun., on the score of his having suggested a similar application in 1839. Now, Sir, I beg to put in a claim of much earlier date on behalf of an old friend of mine, Mr. William Frost, Millwright, of Derby. In 1832, he made a model railway carriage-wheel, bearing a very close resemblance to that patented by Mr. D. and submitted it to the Liverpool and Manchester Railway Company, by whom it was not accepted. A model was left in my possession, and though I have had a long search for it with a view to sending it to you, I regret to say I cannot lay my hands upon it. It was, however, *essentially* the same wheel as Mr. D.'s. As an act of justice to Mr. Frost, I request the favour of your publishing this in your next Number.

I am, Sir, your obedient servant,

S. S. S.

Manchester, November 4, 1840.

[We have been favoured by our correspondent with an inspection of some documents, which fully bear out the statements in his letter; with this exception, that though they prove that Mr. Frost sent in 1832, a model of a wheel differing in no material respect from that of Mr. Dirck's, to a certain individual *to be* submitted to the Liverpool and Manchester Railway, they leave it in doubt whether it was actually submitted to them. Mr. Booth, then, as now, the Manager of the Company, could clear up this point, and will, we are sure, be very willing to do so. Ed. M. M.]

NEW METHOD OF DRAWING PARABOLAS.

Fig. 1.

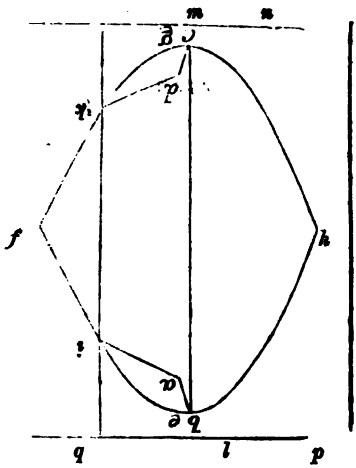
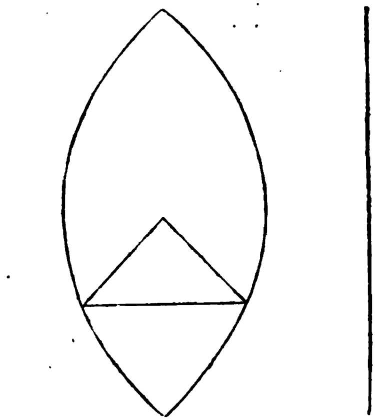


Fig. 2.



Sir,—I take the liberty of sending you the following communication, believing it to contain a new method of drawing a parabola, whereby it is shown to possess two foci like the ellipse, instead of one only, as stated in all works on the subject; to which is added a new definition of a parabola. Should it be deemed worthy, its insertion in the *Mechanics' Magazine* will greatly oblige,

A Subscriber.

London, October, 1840.

To Draw a Parabola.

Let the lines (fig. 1) *a b, b c, c d,* represent a string with its ends fastened at the points *a* and *d*. If the slack of the string be taken up by two pencils, as at *b* and *c*, so that the distance of *b* from *a* is equal to the distance of *c* from *d*; then if they be moved uniformly from a line joining the points *a* and *d*, in the direction *f*, keeping the string tight, they will describe the semi-parabola *b, f, c*. By moving them in a similar manner in the opposite direction, they will describe the other semi-parabola *e, h, g*.

If, on the same side of the axis, two points be taken in any part of a parabola, equally distant from the vertices, the sum of the lines drawn from them to the foci, added to the line joining each other, will be equal to the distance between the two directrixes.

For let *e f g h* (fig. 1) represent a parabola; *a d* its foci; and *n o, p q,* its two directrixes.

Then, since $a\,i + i\,k = l\,k + k\,i$, and $d\,k + k\,i = m\,i + i\,k$; hence, $a\,i + i\,k + k\,d = m\,i + i\,k + k\,l$.

Hence, the following definition of a parabola:

If two points be given in position, the foci of two points the sum of whose distance from them, added to their distance from each other, is always the same, is a curve called a parabola.

Note.—The above definition will apply to the limiting form of the parabola (fig. 2), for, although it has, in fact, only one point in position, yet that point represents the *foci* of the curve. The two points in position, therefore, in this case, coincide or overlap each other.

ON THE EXPANSION OF AIR BY HEAT UNDER PRESSURE.

Sir,—I should feel obliged if you or any of your readers would inform me what is the increased elasticity or pressure of confined air, when exposed to different temperatures. I have not been successful in finding any such table, but in the first part of the treatise on Heat, by the Society for Diffusion of Useful Knowledge, I observe a table which gives "the changes of bulk produced upon 100,000 parts of air by every additional degree of Fahrenheit from 32° to 100, and by every additional ten degrees afterwards to 210°," the following are extracts:—

Temperature.	Bulk.
32°	100,000
100	114,144
150	124,544
200	134,944
210	137,024

Now Sir, I must confess that the small expansion, according to this table, surprises me; if I may judge from this I should conceive that the pressure of air under a similar increase of temperature would merely receive a corresponding trifling increase. When a bladder nearly empty, is placed by a fire, it is inflated by the air within being heated; in this common experiment the air increases in bulk much more than the above table would indicate. I should be glad to have this apparent discrepancy explained.

And oblige Sir,

Your obedient servant,

A READER, B.

London, October 22, 1840.

THE FALLACY OF THE COMMON SYSTEM OF BRIDGE BUILDING EXPLAINED.—BY MR. J. DREDGE, BATH.

Sir,—These figures represent the new and a common suspension bridge, and the strains at various points to which they are exposed by their own weight and position. They are 10 feet deep, 180 feet long each,* and are of equal bases. The ultimate strength of each is 100 tons; the weight of fig. 1 is 6 tons, and that of fig. 2 (as it is the same size throughout) 18 tons. In the former, the strains on the curves at the abutments are only 19 tons 5 cwt., with no central strains or undulation; but in the latter, the strains are 90 tons at the abutments of the curves, also 81 tons at the centre, and the undulation to which it may sometimes be exposed is even more destructive than its weight. Thus, then, the actual strength of fig. 1, for transit use, which is the only object of a bridge, is 80 tons 15 cwt., whilst that of fig. 2 is only 10 tons. Hence the advantages of the former over the latter are *stability and eight times the power, with a third of the materials;* and these are still greater in more extensive bridges.

To find the strains of fig. 1. Rule. Multiply a third of the weight by the length, and divide the product by twice

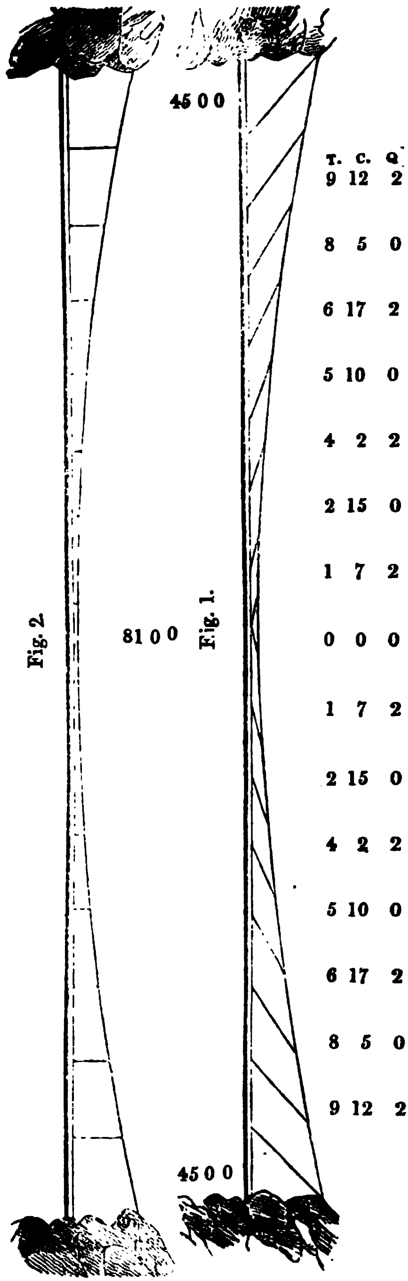


Fig. 2

Fig. 1.

its depth, to which add the remaining

* Depth is the deflection of the arch—length is the distance between the abutments.

weight. *Example.* $2 \times \frac{180}{20} + 4 = 22$, total 22 tons; from which deduct the support afforded by the first rods nearest the towers, which is $\frac{1}{8}$ in this bridge, the remainder is the amount of strains on the bases of the curves.

To find the strains of fig. 2. Rule. Multiply half the weight by its length, and divide the product by twice its depth; this gives the central strains, to which add the remaining weight for the two abutment strains on the curves. *Example.* $9 \times \frac{180}{20} = 81 + 9 = 90$.

Position is the only distinction between Suspension and Compression Bridges; the curves of the former are below, and those of the latter above their bases; reverse the figures, and the fact is proved; or, see Lord Western's clear explanation of the bracket, in his letter to Lord Melbourne on this subject.* In which position is iron strongest? is a question that deserves the greatest attention. In the perpendicular, which is the most powerful situation of compression, an inch bar 20 feet long is powerless; but on suspension, the same would sustain nearly 30 tons. If tapered, it would sustain its own length 60,000 feet; therefore, spans to 4,000 feet extent can be effected with safety, and the cost of such bridges will be as nothing in comparison with their utility.

The only timber required in the construction of suspension bridges is for the flooring, which can at any time be easily repaired, without interfering with the frame, nor can this be objected to, since we now pitch our streets with wood.

I am, Sir, your humble servant,
JAMES DREDGE.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

MILES BERRY, OF CHANCERY-LANE, GENTLEMAN, *for improvements in treating, refining, and purifying oils.*—Petty Bag Office, November 7th, 1840.

Whale oil being heated by steam to 45° (Raumer), a clear solution of chloride of sodium is added, and the whole stirred for twenty minutes, and placed in suitable vats to settle. At the expiration of three days it is drawn off from the sediment, and treated with gallic acid. After another stirring, nitric acid is added (in the proportion of 2 oz. to every 100 lbs.), when it is left to rest until it is perfectly clear and free from smell. The oleine is then separated from the stearine in the following manner: acetate of alumine, nitrate of potash, and chromate of lime, are each added in the proportion of 2 lbs. to every 100 lbs. of oil, previously dissolved in about 5 per cent. of water. The mixture being well stirred, is left to rest for a whole day, when the oleine is separated by filtration through conical felt bags, and the stearine remaining in the bags may afterwards be solidified by pressure.

RICHARD FOOTE, OF FAVERSHAM, WATCHMAKER, *for improvements in alarums.*—Enrolment Office, November 12th, 1840.

These improvements relate to *fire-alarums.* An inverted glass syphon, with the longer leg closed and the short one open, has a quantity of mercury poured in, so as to enclose the air in the upper part of the longest leg; from either end of a balanced lever hang two weights, the one floating on the surface of the mercury in the short leg of the syphon, the other suspended from a guide rod passing through an aperture in a lever connected with a bent spring; a wire passes from this spring to a detent which supports a weight. In the event of fire, the temperature of the apartment becomes raised, and the heat expanding the air contained in the glass tube, the mercury rises and elevates the floating weight, which acting on the spring lever, &c. releases the weight which runs down, and causing a hammer to strike upon a bell gives notice of the fire.

The manner in which this apparatus may be connected with the striking part of an ordinary clock, is also shown in the specification. The claim is, for the mode of letting off an alarum by means of the local heat; also the mode of applying the works of a clock, with a suitable thermometric apparatus for the same purpose.

JOHN DAVIDSON, OF LEITH WALK, EDINBURGH, *for an improved method of preserving salt.*—Enrolment Office, November 12th, 1840.

In order to accomplish this, scale-board or paste-board is coated with oil paint, varnish, or other waterproof composition; when dry it is passed between a pair of rollers, which curls the fabric and facilitates its formation into cylindrical vessels, which are made with a lap joint. Circular discs of wood, of the proper size, are taken to form the top and bottom, being fastened in their places with shellac or other cement. A piece of paper being stuck over the lap joint completes the box, which is then ready for packing of salt, so as to preserve it from the effects of humidity. The claim is for a mode of preserving salt by packing the same in cases of wood, or other material, coated with

* See *Mech. Mag.*, vol. xxxii, page 706.

oil colour or varnish, so as to resist wet or damp.

James Walton, of Sowerby-Bridge, Halifax, Cloth Dresser, *for improvements in the manufacture of beds, mattrasses, pillows, cushions, pads, and other articles of a similar nature, and in materials for packing.*—Enrolment Office, November 12th, 1840.

These improvements consist, 1st, in a mode of manufacturing or constructing of beds, mattrasses, &c., by an assemblage or combination of elastic air-vessels or cells, either connected together externally, or enclosed within a connected covering, or both. 2ndly, in the application of such elastic air-vessels, either connected or unconnected with each other, to the purposes of packing articles of a delicate or fragile nature. 3rdly, the mode of making air-vessels for the foregoing purposes.

Two modes of making the air-vessels are set forth, in the one case they are filled with compressed air, in the other with air of the ordinary atmospheric density. In the first case, a metallic receiver is charged with compressed air by means of a condensing syringe; at the upper part of the receiver there is a pipe furnished with a stop-cock; a jointed lever, countersunk on the under side, is brought down upon the pipe, a small aperture being made through the lever opposite the centre of the pipe. India-rubber bottles are cut in half and soaked in hot water (100° Fahrenheit) and afterwards in cold, to facilitate their separation into laminæ; the thin sheets thus obtained are placed over the pipe and held down upon it by the lever; upon turning the stop-cock the condensed air pushes the india-rubber up through the aperture in the lever expanding it into a ball. When of the proper size and strength for the required purpose, the ball is tied round with thread close to the lever, the superfluous edges being cut off and the joint secured with india-rubber cement.

Another mode is, having a pair of hemispherical cups hinged together, and both connected by tubes with a metal receiver furnished with a stop-cock, from which all the air is extracted; a piece of thin sheet india-rubber being stretched over the face of these cups, the stop-cock is turned when the external atmospheric pressure presses the india-rubber into close contact with the concave surfaces of the two cups; these are then brought together, and the projecting edges of the india-rubber cut close, when they will adhere together forming a ball. Or a pair of hinged dies is taken having a series of corresponding hemispherical concavities sunk all over their surfaces. Small apertures pass from the bottom of each cavity to the interior of the die, which can be connected with an exhausting apparatus. A sheet of india-rubber being stretched over each surface of the die, the air is exhausted from beneath and the india-rubber forced into all the hemispheres: the dies are then closed with pressure, when a series of balls will be formed connected together by a sheet of india-rubber. In order to prevent adhesion of the interior of the balls, in the event of collapse, finely divided flock or other similar substance may be sifted over the india-rubber while on the dies, the parts where adhesion is required being protected by a stencil plate. The adhesion may also be assisted by the application of india-rubber cement. The sheet of balls thus formed may be advantageously employed for packing any goods of a delicate or fragile nature. Beds, mattrasses, &c., may be formed of layers of the sheets of balls, either with or without a thin sheet of india-rubber placed between each layer, the whole being enclosed within an external air-tight covering, covered with any ornamental fabric. Or cushions and such like articles may be filled with a number of the detached air-balls, in a similar manner.

The advantage of this mode of construction is said to consist in the limitation of an accidental injury or rupture to one small air-vessel; whereas in air-cushions, &c. of the ordinary construction, a small puncture allows all the air to escape, and it is then rendered perfectly useless.

William Hannis Taylor, of Norfolk Street, Strand, Gent, *for certain improvements in the mode of forming or manufacturing staves, shingles, and laths, and in the machinery used for that purpose.*—Enrolment Office, November 18th, 1840.

In order to form wood into any of the articles enumerated, it is first steamed till it is rendered soft and pliant. It is then cut into rectangular pieces, by the machine described elsewhere in the present number; or by revolving cutters affixed to a circular iron plate. If the pieces thus produced are intended for staves, they are passed through a second machine, consisting of a strong wooden table, having an iron plate let into it and firmly secured; two curved knives are screwed to the iron plate with their cutting edges uppermost, and placed one at each side of a rectangular opening in the iron plate and table, but projecting a little over it, so that the hollow space between them shall present the exact form proposed to be given to the staves. A pyramidical block of wood, hollow in the centre serves as a cap or covering to the knives, and is bolted to the table. The rectangular pieces of wood from the cutting machine being dropped two or more at a time into the hollow of the foregoing block, rest on the edge of the knives. A vertical stamper being brought down upon the pieces of wood, causes the knives underneath to cut

them into the form required. The staves being thus formed are passed through a third machine (a screw press) which bends them throughout their breadth and length into the bellied or paraboloidal form necessary for casks, barrels, and other like articles. The time required for passing staves through these three machines is so short, that when completed they are still in a warm state, and it is essential that they should not be allowed to become cold between the several operations.

The claim is—1. The process of steaming the wood of which staves, shingles, or laths are formed, to such a state of softness and pliancy, that it can be cut into the requisite form by suitable machinery. 2. The four different machines described in the specification, whereby the said staves, shingles, and laths, can be formed or manufactured with much greater expedition, at much less expense, and with greater uniformity in point of size and shape, than has been hitherto accomplished.

James Callard Davies, of College-place, Camden-town, Jeweller, *for an improved clock or time-piece.* Rolls' Chapel Office, Nov. 23, 1840.

The improvement consists in the application of a train of watch-work to the fourth or last arbor of a train of clock wheels, whereby a clock or time-piece can be made to go for more than twelve months with once winding up; and also in placing the second or third wheel, or both, of the said train, outside the frame, by which combinations or arrangements a very small and portable clock or time-piece is obtained, only requiring winding once in every year; and having one spring-barrel or moving power to each department thereof, that is to say, one to the going and one to the striking part.

The box or spring-barrel, which is arranged for six revolutions, carries on its circumference a wheel of 140 teeth, taking into a pinion of 10, on a wheel of 110. A third wheel of 90 teeth, although one of the main or body wheels of the time-piece, is not placed within the frame as has always been customary, but is placed outside the front plate, and immediately under the dial of the time-piece, by which means an immense saving of room is effected. A hole is drilled in the front plate, just below the circumference of the second wheel, through which the short pinion of 10, forming the arbor of the third wheel, is brought and secured by a cock. The clock works being thus put together, a portion of watch work (commencing with what is usually termed the "centre wheel") is fixed on the front plate in such a manner that the pinion of 9 teeth, forming the arbor of the first or centre wheel, is driven by the third clock wheel. The situation of the other watch wheels are not described, inasmuch as any ordinary train beginning with the centre wheel, with any escapement whatever, may be made applicable to the purpose, regard being had to the motive power possessed by the third wheel, which from being ascertained as compared with that of the fusee wheel, the "calliper" or size of the watch train to be used must be determined accordingly. Where space is not so much an object, as in clocks for brackets, &c., it may not be needful to adopt the second part of the invention. The claim is—"1st, The application of a train of watch wheels, beginning at the centre wheel as aforesaid, to the arbor acted upon by the third wheel of a train of clock wheels as aforesaid; the centre wheel of the watch train being that which is placed upon the said arbor, and the teeth being arranged as aforesaid, whereby I am enabled to keep the time-piece formed thereby, going for more than 12 months with only once winding up. 2ndly. In placing the said second or third wheel of the said clock train, or both, in front of the front plate, or behind the back plate, or at any rate outside the frame, whereby I am enabled greatly to diminish the size of the said clock or time-piece."

NEW PUBLICATIONS.

Tables for the use of Nautical Men, Astronomers, and others, intended principally as Supplementary to the Nautical Almanac and White's Celestial Atlas. By Olinthus Gregory, LL.D.; W. S. B. Woodhouse, Esq., F.R.A.S.; and James Hann, Esq., of King's College. 168 pp. 12mo. Stationers' Company, 1840.

Every person who desires to turn to the best possible account, with the least possible labour, either the *Nautical Almanac* or *White's Ephemeris,* will possess himself of these Tables. A more useful collection for all who "go down to the sea in ships," or whose business it is to teach those who do, can scarcely be imagined. We observe in these Tables a source of error avoided which renders every other set of Nautical Tables we know exceptionable, on account of the deductions requisite to be made for the variations of the Barometer and Thermometer. No such help by mere inspection to "Augmented Refractions" exists elsewhere as is to be found in Table XVIII. of this work, in which the height of the Barometer as diminished by the Thermometer is given even to the tenth of a degree. The names of Gregory, Woodhouse, and Hann—the first of long and well established renown, and the two last of recent yet every-day encreasing reputation—are sufficient guarantees for

the correctness of the Tables; and it is only necessary to give a passing glance at the typography (which we need not say is in tabular work of the first consideration) to be satisfied that they have been admirably seconded by the printers, Messrs. Clowes and Sons. Why is it, may we ask, that the admirable example set by Dr. Bowditch, in the American edition of the *Mecanique Celeste*, of adding the names of the *actual compositors*, has never yet been followed in any English scientific work? Who can doubt that the interests of science and literature, as well as those of the ingenious operative, would be promoted by an extension of the practice?

Hints to Gas Consumers. Second Edition, revised and enlarged. pp. 112. J. W. Parker, West Strand.

When this work originally appeared, we stated our conviction that its author, Mr. J. O. N. Rutter, had performed an essential service both to gas manufacturers and to consumers, by bringing forward in a popular form the information so desirable to be possessed with reference to this illuminating medium. The rapid sale of this little work, the approbation with which it was received, and the frequent enquiries which have been made for it during the few months it has been out of print, have encouraged the Author to prepare another edition. In doing this he has seized the opportunity of carefully revising the whole, and of making several important additions, which from their practical character are calculated to be extensively useful. One chapter of the appendix is devoted to the practices, or rather mal-practices, of gas fitters, with cautions to consumers, against their various schemes of imposition; another chapter treats of the best situation for meters, lights, &c., with a guide to the choice of burners most suitable for different purposes, in which ample justice is done to the patent argand burner of Messrs. Kilby and Bacon, as manufactured by Messrs. Platow and Co., of Hatton Garden, as also to the ingenious gas moderator of the same parties. Every person who either is, or purposes to become a gas consumer, will do well to avail himself of the useful information embodied in these "hints," a careful perusal of which may lead to a great saving of expense, and avert many sources of danger.

PROCEEDINGS OF THE ROYAL INSTITUTION OF CIVIL ENGINEERS.

On the Stamping Engines in Cornwall. By JOHN SAMUEL ENYS, A. Inst. C. E.

"The process of stamping or reducing the ores of tin, in Cornwall, by means of iron stamp-heads, which crush the ore in falling upon it, was formerly effected in mills worked by water power. These have been, from economical and other reasons, for the most part superseded by the use of steam; and, even with inferior engines, the result has been such as to enable the poorer portions of the lode (which were frequently left in the mine) to be now advantageously worked.

"The work performed by the stamping engines was reported with that of the pumping engines, and showed the duty to be from 16 to 25 million lbs. raised one foot high by one bushel of coal, as estimated from the actual weight of the stamp-heads. The engines appropriated for this purpose were generally old double-acting engines of inferior character, and not unfrequently in a bad state of repair. The use of expansive steam was tried with good effect upon them, and induced Mr. James Sims to build an engine calculated more fully to develop the advantages of this principle. He accordingly, in the year 1835, erected one at the Charlestown mines. It was a single-acting engine, communicating the movement direct to the cam shaft for lifting the stampers without the intervention of wheel-work. The first reported duty, in December, 1835, was 43 millions, which was two-fifths more than had previously been performed by stamping engines. Subsequently, Mr. Sims erected other engines of similar construction, and from them may be taken the reported duty in April, 1840:—

Charlestown Mines ..	59,589,884 lbs.
Carn Brae	57,611,073 „
Wheal Ketley........	58,748,452 „

This increased duty induced other engineers to turn their attention to the subject; and they have constructed engines which equal these duties; the chief variation being the adoption of double action, which seems generally to be preferred.

This paper is accompanied by four drawings of the Carn Brae stamping engine, by Mr. Sims, junior, showing in great detail the construction of the engine and the stamping machinery.

On the Effects of the Worm on Kyanized Timber exposed to the Action of Sea Water, and on the use of Greenheart Timber from Demarara, in the same situations. By J. B. HARTLEY, M. Inst. C. E.

There are probably few ports in England where the inconvenience resulting from the attacks of marine worms (*Teredo navalis*) on the timber of the dock gates and other works exposed to their action, is more severely felt than at Liverpool. The river Mersey has a vertical rise of tide of 27 feet at spring, and 13 at neap tides, and the stream being densely charged with silt, a considerable deposit takes place in the open basins, and to some extent in the docks. The latter are cleansed

by means of a dredging machine; but the former are usually "scuttled," for which purpose sewers connected with the docks surround the basins, having several openings furnished with "clows," or paddles, so that the rush of water from the docks may be applied for clearing away the mud from any particular part of the basin. The security of these paddles is, therefore, of the greatest importance, as the failure of one of them might, by allowing a dock to be suddenly emptied, cause great damage to the shipping. These paddles have been usually constructed of English oak or elm, and being much exposed, they suffer from the attacks of the worms. Cast-iron paddles have been tried; but in consequence of the rapidity of the corrosive action, they soon became leaky, and were abandoned. Kyanized oak timber has been tried on the back of these paddles, and found to be perforated by the worm in the same time as unprepared wood. Some oak planks, two inches and a half thick, Kyanized at the Company's yard, were used on the west entrance gates of the Clarence Half-tide Basin, and in 14 months were completely destroyed. Several similar instances of the non-efficiency of the Kyanized timber are given; and the author proceeds to designate the timber which resists best in such situations. He considers that Teak is less liable to injury than English woods, and instances the inner gates of the Clarence dock, which have been built for 10 years, and at present are but slightly attacked.

The timber which he prefers for dock works is the *Greenheart*. It is imported from Demerara, in logs of 12 to 16 inches square by 25 to 40 feet long, and costs about seven shillings per cubic foot. Of its power to resist the attacks of worms, he gives many proofs; one of them may be cited. At the first construction of the Brunswick Half-tide Basin, several elm clows were placed at the west entrance; these were destroyed by the worms in two years, and were replaced by others made of greenheart; the joints of the plank being tongued with deal, to render them completely water-tight. These clows have now been down about seven years, and, although the deal tongueing has been destroyed by the worms, the greenheart planking remains untouched and perfectly sound.

Many methods of protecting common timber have been tried; but the only successful ones adduced are—1st, the use of broad-headed metallic nails driven nearly close to each other into the heads and heels of the gates, but if driven an inch apart, the worm penetrates between them; and, 2ndly, steeping the timber in a strong solution of sulphate of copper from the Parys copper mines in Anglesea. Some paddles made of English elm thus prepared had been in use upwards of three years, and, on an examination, were found to be very slightly injured; while the unprepared timber about them was quite destroyed.

The author observes, that the outer gates of the wet basins are most injured by the worm, from the sills being low down, and the change of water every tide assisting the growth of the worm. Those parts of the gates which are alternately wet and dry are more injured by the worm than the parts immersed always in the same depth of water. At the spot where a leak occurs from a bad joint, a defect in the caulking, or other cause, the worm commences its attack; so that the most incessant attention is required. Those basins into which the sewers of the town discharge themselves are comparatively free from the worm, from which it would appear that sulphuretted hydrogen gas acts in some measure as a protection against the attacks of the worm.

An Account of the actual State of the Works at the Thames Tunnel (June 23, 1840). By M. I. Brunel, M. Inst. C. E.

In consequence of local opposition, the works have not advanced much since the month of March, 1840; but, as that has been overcome, and facilities granted by the City, the works will be speedily resumed, and the shaft on the north bank commenced.

The progress of the Tunnel in the last year has been, within one foot, equal to that made in the three preceding years. During those periods collectively, the extent of the Tunnel excavated was 250ft. 6in., and during the last year the excavation has been 249ft. 6in. This progress has been made in spite of the difficulties caused by the frequent depressions of the bed of the river. These have been so extensive, that in the course of 28 lineal feet of Tunnel, the quantity of ground thrown upon the bed of the river, to make up for the displacement, in the deepest part of the stream, has been *ten times* that of the excavation, although the space of the excavation itself is completely replaced by the brick structure. On one occasion the ground subsided, in the course of a few minutes, to the extent of 13 feet in depth over an area of 30 feet in diameter, without causing any increased influx of water to the works of the Tunnel. The results now recorded confirm Mr. Brunel in his opinion of the efficiency of his original plan, which is "to press equally against the ground all over the area of the face, whatever may be the nature of the ground through which the excavation is being carried." The sides and top are naturally protected; but the face depends wholly for support upon the poling boards and screws. The displacement of one board by the pressure of the ground might be at-

tended with disastrous consequences; no deviation therefore from the safe plan should be permitted.

The paper is accompanied by a plan, showing the progress made at different periods. It is stated that a full and complete record of all the occurrences which have taken place during the progress has been kept, so as to supply information to enable others to avert many of the difficulties encountered by Mr. Brunel in this bold yet successful undertaking.

EXPERIMENTS WITH LOCOMOTIVE ENGINES, ON THE HULL AND SELBY RAILWAY.

(From the *Leeds Mercury*.)

On Tuesday, the 10th instant, a course of five days' experiments commenced with the engines of the above railway, originating through the following circumstances:—

About the commencement of the present year, six engines somewhat similar to those on the Leeds and Selby line, were in greater or less state of forwardness for the Hull and Selby Railway, at the works of Messrs. Fenton, Murray, and Jackson, of this town, when the Hull and Selby Railway Company resolved to have six other engines, on the most approved construction which experience up to that period could produce, from the previous working of locomotives on the various railways. Four objects were particularly kept in view, namely, *safety*, *simplicity*, *accessibility* of the various parts, and *economy*, the whole combining general *efficacy* and *durability* of the engine throughout.

The first object is secured by giving a more extended *base* for the action of the springs in supporting the weight of the engine, being about six and a-half by eleven feet, whereby a remarkably steady motion is secured at thirty miles per hour. It is not at all a matter of surprise that the four wheel engines of several railways now in use should now and then go off the road, and in an instant, when it is recollected the extreme base of their springs for supporting the engine is only about three and three quarters by about six feet; hence their rocking, serpentine, and pitching motion, which without any other cause than a slight increase of speed, literally lifts the flanges of the wheels above the surface of the rails, and in three or four seconds the engine is turned end for end, upset in the act, and the train with it; whilst the stability of the engine is effectually secured through an extended base upon the front and hind wheels. By means of a new combination the best properties of the four-wheeled engines are also completely applied, by resting the weight on the crank-shaft immediately within the wheels, which experience has for years proved to be the least likely to injure it, and thereby avoid the alarming accidents which have so often taken place by the breaking of the shaft, through placing the weight on bearings outside of the wheels; the centre of the engine being a sort of neutral axis, there is very little power over its motion in that part, and this advantage, by placing the weight on the crank inside the wheels, is in consequence got without a sacrifice of stability.

2ndly. In addition to the safety and simplicity of having only *two* inner frames, instead of three or four, with as many bearings on the crank shaft, the space under the boiler is still further stripped of machinery by a new valve motion, which gives a high degree of openness and facility of access so desirable in examination, cleaning, &c., of the working parts.

3rdly. The steam being used expansively by the valve motion above alluded to, a great saving in fuel is effected, as will be seen on examining the results of the experiments; and as the excessive wear and tear of locomotive boilers arises from intense heat, it is not improbable this decided step towards removing the cause will prevent the effect, namely, the rapid destruction of the boiler. The action of this valve motion is perfectly smooth, being worked by eccentrics (which are also of an improved construction), and any quantity of steam from 25 to 90 per cent. on the stroke can be admitted into the cylinders with the most ready and complete control, at any speed the engine may be going; if a high wind or an incline oppose the progress of the engine, a greater quantity of steam is admitted; if wind or gradients be favourable, the steam is still admitted at full pressure into the cylinders, but shut off at an earlier period, propelling the pistons the remainder of the stroke by its elastic force, similar to driving a time-piece by the uncoiling of the main-spring.

Lastly. A combination of dimensions and proportions have been gleaned from the best results of locomotive engines of various constructions, and in use in different parts of the country. The driving wheels are 6 feet diameter, length of the stroke 2 feet, diameter of cylinders 12 inches, inside dimensions of fire-box 3 by 3½ feet, tubes 94 in number by 9½ feet long and 2 inches diameter. The general diminution of machinery in the construction has given room for ample dimensions in the principal working parts, and thus the whole arrangement has a close bearing on *safety*, *simplicity*, *accessibility*, *and economy*.

Circumstances led to those engines being ordered of Messrs. Shepherd and Todd, Railway Foundry, of this town. The Hull and Selby line was opened with the engines of

the former order, but the public and the Company being so much annoyed by hot cinders from their chimneys, burning whatever they lighted upon, and rapidly destroying the smoke-boxes themselves, three of those engines were altered, and succeeded to a considerable extent in diminishing the nuisance, whilst the engines performed better, and with less fuel. That fact, however, being questioned, and two engines of the *improved* construction having got to work, Mr. John Gray, the engineer of the locomotive department, and patentee of the improved engines, urgently requested a most rigorous and simultaneous trial of the different engines, and to be witnessed for the parties concerned by persons above suspicion. Mr. J. Miller and Mr. T. Lindsley represented Messrs. Fenton, Murray, and Jackson; Mr. J. Craven and Mr. J. Barrons represented Messrs. Shepherd and Todd; and Messrs. E. Fletcher, W. B. Bray, J. G. Lynde, jun., J. Farnell and J. Gray, were the representatives of the Hull and Selby Railway Company. The arrangements for the experiments were, that the gross load should include engine, tender, carriages, and everything in the train.

The steam was got up in the respective engines to the pressure of from 56 to 66 lbs. per square inch; the fires filled to a certain level at the starting in the morning, and filled to the same level on finishing the last trip at night. The pressure of steam at starting was generally up to 66 lbs., and was at about half that pressure at the end of each trip. There were *fifty* experimental trips made in all, namely, 24 trips with the *Collingwood*, *Andrew Marvel*, and *Wellington*, the unaltered engines of Messrs. Fenton, Murray, and Jackson. Their average gross load was 53.4 tons, or 1,656 tons, over one mile: consumption of coke 1,013 lbs. or 0.611 lbs. per ton per mile; water 6,500 lbs. or 3.90 lbs. per ton per mile. There were 10 trips made with the other three engines of Messrs. Fenton, Murray, and Jackson, which were altered at Hull, namely, the *Exley*, *Kingston*, and *Selby*. Their average load was 49.16 tons, or 1,524 tons over one mile; consumption of coke 635 lbs. or 0.416 lbs. per ton per mile; water 4,264 lbs. or 2.79 lbs. per ton per mile.

The *patent* engines made by Messrs. Shepherd and Todd, viz. the *Star* and *Vesta*, made 16 trips, and their average loads, &c., were 55.4 tons, or 1,718 tons over one mile; coke consumed, 465 lbs. or 0.271 lbs. per ton per mile; water 2,874 gals. or 1.62 lbs. per ton per mile. The average gross load of all the 50 trips is 53.2 tons, or 1,649.4 tons over one mile, and taking that as a standard load, the consumption of fuel and water performing exactly equal quantities of work, is represented in the following tables:—

Class of Engine.	Load in tons conveyed over one mile.	Elsecar Coke used per trip of 31 miles in lbs.	Coke used per mile in lbs.	Coke used per ton per mile in lbs.	Water used per trip of 31 miles, in lbs.	Water per mile in lbs.	Water per ton per mile in lbs.
Patent ……	1649.4	446.98	14.41	0.271	2672	86.19	1.62
Altered ……	1649.4	686.15	22.13	0.416	4601.8	148.43	2.79
Unaltered …	1649.4	1007.78	32.59	0.611	6432.6	207.5	3.90

The financial annual result of the three classes of engines for coke and boilers, with such a traffic as that of the Hull and Selby line, will be about—

4,500*l.* for the unaltered engines.

3,250*l.* for the altered do.; and about

2,000*l.* for the patent engines.

In conclusion, it is deserving of remark, that *all* the attesting witnesses expressed themselves highly satisfied with the manner in which the experiments had been conducted, and with the facilities which the Company so readily granted to enable them to come at correct results. Probably no experiments were ever made under similar circumstances where the parties concerned displayed greater independence, impartiality, and good feeling, than on the present occasion.

THOUGHTS ON THE CASTING OF STATUES IN METAL. BY SIR J. ROBISON, F. R. S. E.

[The eligibility of adopting cast iron as a material for the construction of ornamental statues having recently been rediscussed in some of the public journals, an esteemed correspondent has suggested to us the propriety of reprinting the following able paper upon that subject, from the "Edinburgh New Philosophical Journal," for April, 1833—a suggestion which we readily comply with, as the remarks of the writer are deserving of a much more extensive circulation than could be afforded by the work in which they originally appeared.—Ed. M. M.]

"When we consider in a superficial manner the comparatively small number of ancient bronze statues which have reached our times; or read the animated, though somewhat ludicrous account given by Benvenuto Cellini, of the obstacles he encountered in casting the statues of Perseus;* and when we advert to the large sums required in the present day for casting works of art in bronze, we are at first apt to imagine that the great cost of such works must be the consequence of some mysterious difficulty in the process; but if we go on to examine more closely into the grounds upon which this opinion is founded, we begin to perceive the anomaly of any such difficulty being supposed to exist in this country, where immense works have been executed in cast metal, works requiring a rigid accuracy of ultimate dimensions not at all necessary in statuary, in which, if the relative properties be truly kept, no injurious effect is produced by the shrinking of the metal which takes place in cooling.†

"On further consideration we are compelled to admit, that where skilful founders and capacious furnaces abound in every district where the most intricate castings are daily and hourly made in masses varying in weight from a few grains to many tons, the difficulty, *if any really exist*, should not be sought for in the moulding pit of the founder.

"The question then comes to be asked, what is the reason that we see so few great statues in metal, and why are modern ones so costly in their execution? We apprehend, the true reply is, that bronze, the material usually employed in statuary is dear; and that as casting in bronze is not a common operation, furnaces have to be erected, and workmen collected, at a great expense for each separate occasion.

"If it be allowed that these are the principal causes of the comparative rarity, and of the great cost of bronze statuary, it is surely worth enquiring, whether, by employing cast iron instead of bronze, we may not materially diminish the cost; and whether, if in making this substitution, there be any thing likely to arise to counterbalance the advantage which we should gain from the great saving of expence.

"In employing iron as the material instead of bronze, we should make a double profit. *First:* From the cost of one metal being about a twentieth part of the other; and, *secondly*—from the circumstance, that, in the immediate vicinity of most places where such castings would be required, foundries would be ready with numerous workmen fully competent to undertake more difficult tasks than would have baffled Cellini with the aid of the driest fire wood which Florence could have furnished him.*

"One component part of the price of an original statue still remains to be adverted to. We mean the remuneration to the artist who designs the model, and superintends the moulding. This every lover of the fine arts would wish to be liberal; but when the aggregate expense is unnecessarily great, and when the sculptor is forced to assume the (to him) foreign employment of a brass founder, he may often be obliged to sacrifice a portion of what he would be entitled to expect as the reward of his talent or the recompence for the risk and anxiety he is made to undergo.

"If, by adopting a cheaper material, and a less expensive method of casting, we should succeed in greatly reducing the cost of statuary, we could more easily afford a liberal remuneration to the genius of the sculptor, the natural consequences of which would be, that more talent would be called forth, and the public places of our cities would soon be enriched by numerous works of art; perhaps we should by degrees come to vie even with those countries whose more favourable climates have led to a greater developement of talent in this branch of the arts than we have hitherto been able to boast of manifesting.

* Cellini's difficulties must have arisen from want of power in his furnace, as he says he overcame them by debasing his bronze with pewter, and by getting some well-dried firewood from a neighbour.

† The casting of a cylinder for a steam engine of 200 horse-power is a more delicate operation than that of a group of statuary; an air hole or flaw which might be imperceptible, is easily repaired in the statue, but would be fatal to the other, though it might not be discovered till great expense had been incurred in finishing it.

* Where fuel is scarce, and of inferior quality, artists will necessarily prefer that metal of which they can accomplish the fusion. If the Greeks or Romans had possessed pit-coal and iron, they would probably have used them in their foundries; having only wood they used bronze. The Dutch who have turf for fuel, make statues of lead, while the Belgians, having coal mines, are now making them of iron.

"It will perhaps be objected by some persons, that iron is too mean a material to be used in the higher classes of statuary, but we apprehend that this is a prejudice which will yield on a little reflection. We do not think iron is too mean to form the mainspring of a chronometer, the sabre-blade of a hussar, or the sword hilt of a courtier, in which latter form we learn from Mr. Babbage it has encreased its original value 973 times.* If fitness for the end be the criterion we are to judge by, and if iron be susceptible of taking a sharper impression from a mould than bronze (which no one can doubt who examines the Berlin and other similar castings), we are bound to admit that, in this respect at least, it is a better material for doing justice to the model of the artist. We may then proceed to inquire whether there be anything in the nature of the metal to make it likely to be less durable than bronze.

"In one material point, iron statues must have the advantage, as the labour which would be required to overthrow and break up a large figure, would scarcely be repaid by the price obtainable for its fragments; while the experience of ages shows us, that the marketable value of bronze affords an irresistible temptation in times of popular tumult; and that gods and goddesses, when made of that material, are not always immortal.

"If danger be apprehended from the liability of the surface of iron to deteriorate by oxidation, we would say, that there is not much difference in this respect between bronze and *cast* iron, and that if the same means be taken to prepare and preserve the surface of an iron statue, as is usual with a bronze one, the weather would make little impression on it. We see around us examples of coarse castings, to the preservation of which little or no attention has been paid, and in which no sensible degradation of the surface has taken place, even in long periods of time. It may, therefore, be fairly inferred, that by the exercise of a little skill, and of a moderate degree of attention, the external appearance of a grand work of art in iron may be made pleasing to the eye of taste, and may be preserved uninjured for generations.

"If we be not greatly mistaken in the effects which must flow from the late improvements in the smelting of iron ore, which have been introduced in some of the furnaces on the Clyde, cast iron of the finest quality for such purposes will soon be so cheap that we shall see it largely employed in architectural decoration. We should take advantage, therefore, of the means which nature and art have so liberally bestowed on us; and we should strive to make Britain as distinguished for her display of the fine arts as she has hitherto been for her success in the mechanical ones."

LIST OF DESIGNS REGISTERED BETWEEN OCTOBER 22ND AND NOVEMBER 23RD.

Date of Registration.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Oct. 28	443	J. Jones	Lamp	3 years.
"	444	J. Ridgway	A plate	1
30	445	W. and H. Hutchinson	Tube	3
"	446	W. Hancock	Drawer knob	1
Nov. 2	447	M. Platow	Gas burner	3
"	448,9	J. and J. Walker	Cantoon	1
4	450	W. Hancock, jun.	Flesh brush or glove	1
"	451	T. Selby	Tobacco box	3
5	452	Woodward, Gandell and Co.	Carpet	1
9	453	T. Nicholson, and J. E. Hoole	Stove	3
"	454	G. Wheeler	Pencil case	3
"	445,6	S. T. Barr	Hand bill	1
11	457	Kiteley and Fawcett	Carpet	1
12	458	J. Cartwright	Thrashing-machine drum	3
13	459	Carron Company	Stove	3
"	460,476	Wilcoxon and Sons	Stained paper	1
16	477	J. Rostron	Cantoon	1
17	478	J. Hiles	Carpet	1
"	479	Broadhead and Atkin	Coffee pot	3
"	480	Ditto Ditto	Jug cover	3
"	481	W. Blews	Candlestick	3
"	482	Imray and Fitch	Almanack	1
18	483	Mitchell and Son	Envelope	1
23	484	Butler, Brothers	Coffin plate	3

* Many of those beautiful miniature statues in French clocks, which we consider as bronze *dorés*, are, in point of fact, made of cast iron; but as the gold cannot be applied by amalgamation as in the case of bronze, the iron ornaments may be detected by their inferior appearance of the gilding.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 22ND OF OCTOBER AND THE 20TH OF NOVEMBER.

John Duncan, of Great George-street, Westminster, gent., for improvements in machinery for cutting, reaping, or severing grass, grain, corn, or other like growing plants or herbs. (A communication.) November 2; six months.

Elijah Galloway, of Manchester-street, engineer, for improvements in propelling railroad carriages. November 2; six months.

Josiah Pumphrey, of New-town-row, Birmingham, brass founder, for certain improvements in machinery to be employed in the manufacture of wire hooks and eyes. November 2; six months.

Henry Wimshurst, of Limehouse, ship builder, for improvements in steam vessels in communicating power to propellers of steam vessels and in shipping and unshipping propellers. November 2; six months.

James Heywood Whitehead, of Royal George Mills, York, manufacturer, for improvements in the manufacture of woollen belts, bands, or driving straps. November 2; six months.

James Boydell, jun., of Cheltenham, for improvements in working railway and other carriages, in order to stop them, and also to prevent their running off the rails. November 2; six months.

John Edward Orange, of Lincoln's-inn, Old-square, Captain in the 81st Regiment, for improvements in apparatus for sewing ropes and cables with yarn. November 2; six months.

Herman Schroeder, of Surrey-cottage, Peckham, broker, for improvements in filters. (A communication.) November 2; six months.

John Wordsworth Robson, of Wellclose-square, artist, for certain improvement or improvements in water closets. November 2; six months.

Richard Farger Emmerson, of Walworth, gent., for improvements in applying a coating to the surface of iron pipes and tubes. November 3; six months.

John Rapson, of Limehouse, millwright, for improvements in paddle wheels for propelling vessels by steam or other power. November 3; six months.

Henry Hind Edwards, of Nottingham-terrace, New-road, engineer, for improvements in evaporation. November 5; six months.

Pierre Mathew Maunoury, of Paris, but of Leicester-square, gent., for improvements in wind and stringed musical instruments. (A communication.) November 5; six months.

George Gwynne, of Duke-street, Manchester-square, gent., for improvements in the manufacture of candles and in operating on oils and fats. November 5; six months.

George Dacres Paterson, of Truro, esq., for improvements in curvilinear turning; that is to say, a rest adapted for cutting out wooden bowls, and a self-acting slide rest for other kinds of curvilinear turning. November 5; six months.

John Clarke, of Islington, Lancaster, plumber and glazier, for an hydraulic double-action force and lift pump. (A communication.) November 5; six months.

Charles Joseph Hullmandel, of Great Marlborough-street, lithographic printer, for a new effect of light and shadow imitating a brush or stump drawing, or both combined, produced on paper, being an impression from a plate or stone prepared in a particular manner for that purpose, as also the mode of preparing the said plate or stone for that object. November 5; four months.

Henry Kirk, of Blackheath, gent., for improvements in the application of a substance or composition as a substitute for ice for skating and sliding purposes. November 5; six months.

George Delianson Clark, of the Strand, gent., for an improved method of purifying tallow fats and oils for various uses, by purifying them and depriving them of offensive smell, and by solidifying such as are fluid, and giving additional hardness and solidity to such as are solid, and also by a new process of separating stearine or stearic acid from the oleine in such substances. (A communication.) November 5; six months.

Alexander Horatio Simpson, of New Palace-yard, Westminster, gent., for a machine or apparatus to be used on a moveable observatory or telegraph, and as a moveable platform in erecting, repairing, painting, or cleaning the interior and exterior of buildings, and also as a fire-escape. (A communication.) November 5; six months.

Andrew Kurtz, of Liverpool, manufacturing chemist, for a certain improvement or certain improvements in the construction of furnaces. November 5; six months.

George Halpin, jun., of Dublin, civil engineer, for improvements in applying air to lamps. November 7; six months.

William Crofts, of New Radford, Nottingham, machine maker, for certain improvements in machinery for the purpose of making figured or ornamented bobbin net or twist lace and other ornamented fabrics, looped or woven. November 7; six months.

Charles de Bergue, of Blackheath, gent., for improvements in machinery for making reeds used in weaving. (A communication.) November 7; six months.

Edward Dodd, of Kentish-town, musical instrument maker, for improvements in piano fortes. November 7; six months.

George Edmund Donisthorpe, of Leicester, machine maker, for certain improvements in machinery or apparatus for combining and preparing wool and other textile substances. November 7; six months.

John Joseph Mechi, of Leadenhall-street, cutler, for improvements in apparatus to be applied to lamps, in order to carry off heat and the products of combustion. November 10; two months.

Thomas Lawes, of Canal-bridge, Old-Kent-road, feather factor, for certain improvements in the method or process and apparatus for cleansing and dressing feathers. November 10; six months.

William M'Kinley, of Manchester, engraver, for certain improvements in machinery or apparatus for measuring, folding, plaiting, or lapping goods or fabrics. November 10; six months.

Charles Edwards Amos, of Great Guildford-street, Borough, millwright and engineer, for certain improvements in the manufacture of paper. November 10; six months.

Thomas William Parkin and Elisha Wylde, of Portland-street, Liverpool, engineers, for an improved method of making and working locomotive and other steam engines. Nov. 12; two months.

Eugenius Birch, of Cannon-row, Westminster, civil engineer, for improvements applicable to railroads, and to the engines and carriages to be worked thereon. November 12; six months.

John Heaton, of Preston, overlooker, for improvements in dressing yarns of linen or cotton, or both, to be woven into various sorts of cloth. November 12; six months.

Otto C. Von Almonde, of Threadneedle-street, merchant, for improvements in the production of Mosaic work from wood. (A communication.) November 12; six months.

Charles Dod, of Buckingham-st., Adelphi, gent. for certain methods or processes for the manufacture of plate glass, and also of substances in imitation of marbled stones, agates, and other minerals, of all forms and dimensions, applicable to objects both of use and ornament. (A communication.) November 12; four months.

Charles Wye Williams, of Liverpool, civil engineer, for certain improvements in the construction of furnaces and boilers. November 17; six months.

Joshua Shaw, of Goswell-street-road, Old-street, artist, for certain improvements in discharging Ordnance muskets, fowling pieces, and other fire arms. November 17; six months.

Joseph Whitworth, of Manchester, engineer, and John Spear, of the same place, gent., for certain improvements in machinery tools, or apparatus for cutting and shaping metals or other substances. November 17; six months.

James Deacon, of St. John's-street-road, gent., for improvements in the manufacture of glass chimneys for lamps. November 19.

Alexander Stevens, of Manchester, engineer, for certain improvements in machinery or apparatus to be used as a universal chuck for turning and boring purposes, which said improvements are also applicable to other useful purposes. November 19; six months.

William Henson, of Allen-street, Lambeth, engineer, for improvements in machinery for making or producing certain fabrics with threads or yarns, applicable to various useful purposes. November 19; six months.

John Cox, of Ironmonger-lane, civil engineer, for certain improvements in the construction of ovens applicable to the manufacture of coke and other purposes. November 21; two months.

John Wakefield, of Salford, hat manufacturer, and John Ashton, of Manchester, hat manufacturer, for certain improvements in the manufacture of hat bodies. November 21; six months.

William Henry Hutchins, of Whitechapel-road, gentleman, and Joseph Bakewell, of Brixton, civil engineer, for improvements in preventing ships and other vessels from foundering and also for raising vessels when sunk. November 21; six months.

Francis Pope, of Wolverhampton, engineer, for improvements in detaching locomotive and other carriages. November 24; six months.

John Haughton, of Liverpool, clerk, M.A., for improvements in the means employed for preventing railway accidents resulting from one train overtaking another. November 24; six months.

Henry Bailey Webster, of Ipswich, surgeon in the Royal Navy, for improvements in preparing skins and other animal matters for the purpose of tanning and in the manufacture of gelatine. November 25; six months.

Charles Grillett, of Hatton-garden, for new modes of treating potatoes in order to their being converted into various articles of food and new apparatus for drying applicable to that and other purposes. (A communication.) Nov. 25; six months.

Henry Walker Wood, of Chester-square, gent., for an improvement in producing an uneven surface in wood and other substances. (A communication.) November 25; six months.

Junius Smith, of Pen-court, Fenchurch-street, esq., for certain improvements in furnaces. November 25; six months.

Frederick Theodore Philippi, of Bellfield-hall, Lancaster, calico printer, for certain improvements in the art of printing cotton, silk, and other woven fabrics. November 25; six months.

Nathaniel Batho, of Manchester, engineer, for certain improvements in machinery tools or apparatus for planeing, turning, boring, or cutting, metals and other substances. Nov. 25; six months.

Thomas Barratt, of Somerset, for improvements in the manufacture of paper. November 25; six months.

Henry Charles Daubeny, of Boulogne, Esq., for an improvement in making and forming of paddle-wheels, for the use of vessels propelled in the water by steam or other power, and applicable to propel vessels and mills. November 25; six months.

James Lee Hannah, doctor of medicine, of Brighton, for an improvement, or improvements in fire escapes. November 25; six months.

Oliver Louis Reynolds, of King-street, Cheapside, merchant, for certain improvements in machinery for producing stocking fabrics, or frame-work knitting. November 25; six months.

Robert Roberts, of Bradford, Manchester, blacksmith, for a new method or process for case-hardening iron. November 25; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND FROM 22ND OF OCTOBER TO 21ST OF NOVEMBER, 1840.

Thomas Smedley, of Holywell, Flintshire, gentleman, for certain improvements in the manufacture of tubes, pipes, and cylinders. Sealed; October 27.

George Hicks, of Manchester, agent, for an improved machine for cleaning or freeing wool and other fibrous materials of burs and other substances. October 27.

Miles Berry, 66, Chancery Lane, Middlesex, for certain improvements in the arrangement, construction, and mode of applying certain apparatus for propelling ships and other vessels. (A communication.) October 29.

Edmund Rudge, Jun., of Tewkesbury, Gloucester, tanner, for a new method or methods of obtaining power for locomotive and other purposes, and of applying the same. November 2.

Benjamin Hick, Jun., of Bolton le Moors, Lancaster, engineer, for certain improvements in regulators or governors, for regulating, or adjusting the speed or rotary motion of steam engines, water wheels and other machinery. November 3.

John Condie, manager of the Blair iron works, Dalry, in the county of Ayr, in Scotland, for improvements in applying springs to locomotive and railway, and other carriages. November 4.

Luke Hebert, of Birmingham, Warwick, solicitor of patents, for improvements in the manufacture of coffered spades and shovels, soughing and grafting tools. (A communication.) November 4.

Arthur Wall, of Bermondsey Wall, Surrey, surgeon, for a new composition for the prevention of corrosion in metals, and for other purposes. Nov. 5.

James Heywood Whitehead, of the Royal George Mills in Saddleworth, York, manufacturer, for improvements in the manufacture of woollen belts, bands or driving straps. November 6.

Samuel Wilkes, of Darleston, Suffolk, iron founder, for improvements in the manufacture of vices. November 6.

Joseph Bennett, of Turnlee, near Glossop, Derby, cotton spinner, for certain improvements in machinery for cutting rags, ropes, waste, hay, straw, or other soft or fibrous substances, usually subject to the operation of cutting or chopping, part of which improvements are applicable to the tearing, pulling in pieces, or opening of rags, ropes, or other tough materials. November 9.

Charles Payne, of South Lambeth, Surrey, gentleman, for improvements in salting animal matters. November 11.

Henry Hind Edwards, of Nottingham Terrace, New Road, Middlesex, for improvements in evaporation. (A communication.) November 11.

Elijah Galloway, of Manchester-street, Middlesex, engineer, for improvements in propelling railroad carriages. November 11.

Nathan Defries, of Paddington-street, Middlesex, engineer, for improvements in gas meters. November 11.

Henry Holdsworth, of Manchester, Lancaster, cotton spinner, for an improvement in carriages used for the conveyance of passengers on railways, and an improved seat applicable to such carriages, and to other purposes. November 11.

Joseph Whitworth, of Manchester, Lancaster, engineer, for improvements in machinery, or apparatus for cleaning and repairing roads or ways, and which machinery is also applicable to other purposes. November 16.

Samuel Wilkes, of Darlington, Suffolk, iron founder, for improvements in the manufacture of hinges. November 17.

Thomas Horne, of Birmingham, Warwick, brass-founder, for improvements in the manufacture of hinges. November 18.

James Smith, of Deanston Works, in the parish of Kilmadock, Perth, cotton spinner, for improvements in the preparing, spinning, and weaving of cotton, silk, wool, and other fibrous substances, and in measuring and folding woven fabrics. Nov. 19.

Benjamin Winkles, of Northampton-street, Islington, Middlesex, steel and copper-plate manufacturer, for certain improvements in paddle and water wheels. November 19.

Robert Hawthorn and William Hawthorn, of Newcastle-upon-Tyne, civil engineers, for certain improvements in locomotive and other steam-engines in respect of the boilers, and the conveying of steam therefrom to the cylinders. Nov. 20.

Peter Bradshaw, of Dean, near Kimbolton, Bedford, gentleman, for improvements in dibbling and drilling corn, seeds, plants, roots, and manure. November 20.

LIST OF IRISH PATENTS GRANTED FOR NOVEMBER, 1840.

F. Hills, for certain improvements in steam-engines, steam boilers and locomotive carriages.

J. Johnston, for a new method (by means of machinery) of ascertaining the velocity of, or the space passed through by ships, vessels, carriages and other means of locomotion, part of which is also applicable to the measurement of time.

R. G. Ranson and S. Milbourn, for improvements in the manufacture of paper.

C. Wheatstone and W. F. Cook, for improvements in giving signals and sounding alarms at distant places by means of electric currents.

R. Beard, for improvements in the apparatus for taking or obtaining likenesses and representations of nature, and of drawings and other objects.

D. Edwards, for improvements in preserving potatoes and other vegetable substances.

Thomas Milner, for certain improvements in boxes, safes, or other depositories for the protection of papers or other materials from fire.

Thomas Clark, for certain improvements in the construction of locks, latches, and such like fastenings, as applicable for securing doors, gates, windows, shutters, and such like purposes.

NOTES AND NOTICES.

Rock Crystal Spun.—M. Gaudin sent to the Academy of Sciences, at the last (April) session, specimens of rock crsytal, which he had succeeded in melting and drawing out into threads several feet in length, with the greatest ease. One of these can be wound into a skein, and the other wound round the finger. M. Gaudin has found also, that melted rock crystal moulds easily by pressure, and that it is very volatile at a temperature a little above its melting point. Alumina acts very differently from silica; it is always perfectly fluid, or crystalized, and cannot be brought to a state of viscosity; while viscosity, separate from all tendency to crystalization, is the permanent condition of silica under the oxygen blow-pipe. Alumina is much less volatile than silica; it often, however, undergoes ebullition. In a more recent essay, M. Gaudin has tried the temper and relations of rock crystal, which has afforded unexpected results. If a drop of melted crystal fall into water, far from cracking and flying to pieces, it remains limpid, and furnishes good lenses for the microscope. When struck by a hammer, the instrument rebounds, and the lump will sink into a brick rather than break: its tenacity is such, that pieces can be detached only as splinters. It resembles steel in elasticity and tenacity. Silicious compounds act nearly in the same way as rock crystal. The sandstone of the pavements spin off like it, with this difference, that its threads, instead of being limpid, are a pure white, nacreous, silky, and chatoyant, in a singular degree, so that they might be mistaken for silk; and the globules, to a certain degree, have the aspect of fine pearls. There is no doubt that in this way successful means will be employed in producing imitations which will be preferred to natural pearls, since they will possess the hardness of annealed rock crystal, instead of that of a calcareous compound. The emerald threads perfectly well, and its threads, which scratch rock crystal, are also more tenacious than crystal threads.—*Jour. de Pharm.*

Paint for Metallic Surfaces.—The scaling off of paint from metallic surfaces arises generally from the contraction of the paint leaving minute cracks through which moisture penetrates to the surface, and insinuates itself below the scale, this may be greatly palliated, by heating the paint before applying it, and by melting in it a small portion of bees wax, which prevents the shrinkage and the formation of cracks. A paint is much used in India for ornamenting work which is to be exposed to heat and moisture—viz.: finely granulated tin, or rather tin in fine powder (formed by shaking melted tin in a joint of bamboo, or a wooden box,) this is mixed up in a vehicle of glue water, is burnished by an agate when dry, and is then covered with oil varnish, in this state it defies for a long time the sun and rain of a tropical climate. K. H.

Symington's Condensation.—Sir,—In disputes between individuals and companies, I would in nine cases out of ten take the word of the individual, if I knew him to be an honourable man. Mr. Bowie having stated that I am in error on the cramming down throat point, I am willing to believe that I have been misinformed, and therefore trouble you with this to express a hope that he will not occupy your pages with "the facts of the case," which neither myself nor the public care anything about. I remain, your obedient Servant,

23rd November. SCALPEL.

Patent Composition for Fuel.—A correspondent of the "Monthly Magazine" in 1815, states that it was the practice in Wales to mix equal quantities of carbon or dross of coal and sea mud. This he states is laid up for use in large masses in sheds or cellars, and every morning a certain portion is well mixed with a spade and rolled by hand into balls of 3 or 4 inches diameter, six or eight of these are laid on the fire, &c. I need not point out to your readers the similarity to some of the patent compositions.

Nov. 9, 1840. C. C. C, C.

The Warrington Iron Steam-boat.—Sir,—On Wednesday the first iron steamer built in Warrington made a trip between that town and Liverpool, which she accomplished in two hours and nine minutes, the distance being over 30 miles, and having for three-fourths of the way a laden flat fastened behind. This vessel has been manufactured on the most approved plans by the Bridge Foundry Company of Warrington, which firm has long been famous for the make of flats and other iron boats to a rather large extent. The present vessel was launched from that Company's yard on the 21st January last, when she was named the *Warrington*, in honour of the town in which built. Her hull is wholly of iron, the extreme length of which is 110 feet, breadth 19 feet, and depth 9 feet 6 inches; she is divided into three parts by water-tight divisions of wrought iron; her burthen is from 2 to 300 tons; she has two engines of 70 horses power, with three boilers, beams, side levers, &c., as usual; the cylinders are 32 inches diameter, length of stroke 3 feet 6 inches, paddle-wheels 15 feet diameter; her draught is about 3 feet, and she will doubtless prove a useful vessel to parties who require speed and light draught of water. I am, Sir, your obedient Servant,

Liverpool, Nov. 16th, 1840. J. S. W.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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WHITELAW AND STIRRAT'S PATENT WATER-MILL.

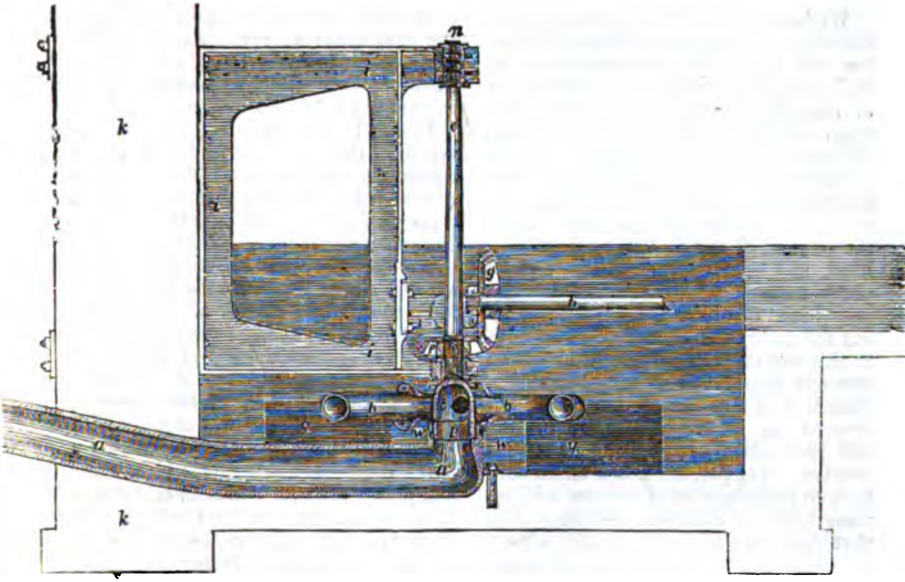
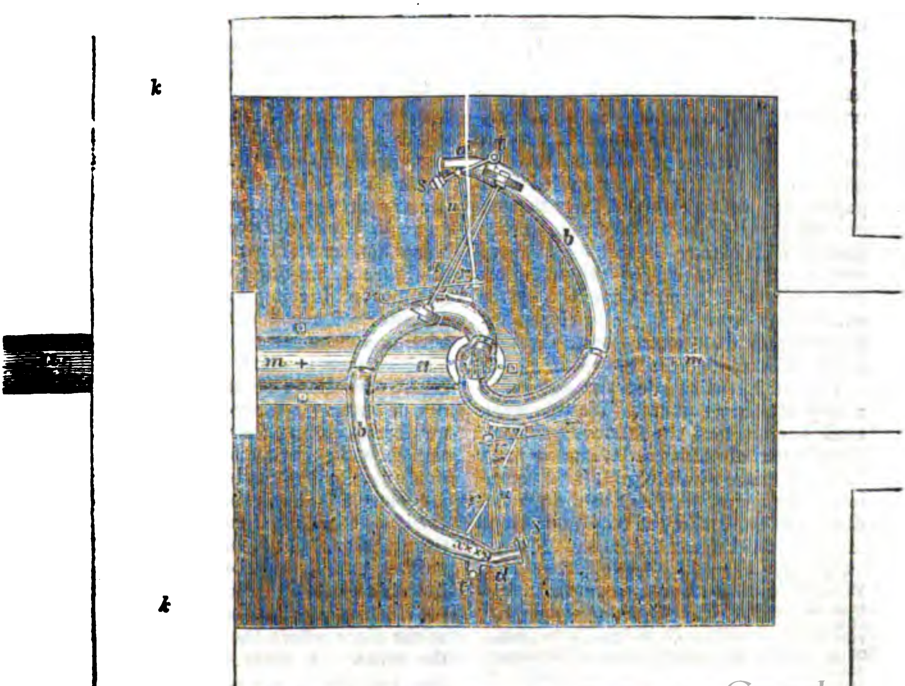


Fig. 2.



WHITELAW AND STIRRAT'S PATENT WATER-MILL.

We have on several occasions noticed the successful progress of Messrs. Whitelaw and Stirrat, in the application of their new patent water-mill. The results of the experiments already made, and upon a scale which precludes the possibility of error, have been such, as to establish the great superiority of this hydraulic machine over all previous contrivances for the like purpose. Since the erection of the first machine of this kind, and the reports published of its performances, a very general interest has been manifested by parties having the command of water-power, both in this and other countries, to obtain an accurate knowledge of its capabilities. Numberless applications have been *addressed* to us by parties, requesting full particulars of this important invention. The patentees themselves have been overwhelmed with similar solicitations from all quarters, and they state that they have found much difficulty in individually answering the applications made to them, more particularly as these were mostly accompanied with a wish for information on the subject of water-power in general. In order to meet this difficulty, the patentees have recently brought out a neatly got up pamphlet,* containing a clear and practical exposition of the construction, powers, and performances of their water mill, to which they have added two papers of great value and importance: one on the method of determining the power which may be obtained from any given fall of water—the other on the subjects of economising the water which runs down a fall, and of rendering available as a water-power the rain which falls on high lands.

The subject is handled throughout in a very masterly manner. We this week avail ourselves of the following extract, descriptive of Messrs. Whitelaw and Stirrat's patent water-mill, and commend the pamphlet itself to the perusal of such of our readers as may be desirous of making themselves acquainted with the best mode of making available the vast amount of power continually offered for acceptance in many situations by the bountiful hand of Nature.

Figure 1 (see front page) is a side elevation of the new water-mill, in which figure some of the parts are drawn in section. Figure 2 is a plan showing the arms and other parts of the machine. The main-pipe *a a* carries the water which drives the machine into its arms, from a reservoir or any suitable place on a higher level than the arms. *b b* are the arms, which are hollow; the water passes into them at the centre part *c*, and escapes out at the jet-pipes *d d*. *e e* is the main or driving shaft of the machine, which is shown cast in one piece with the arms. *f* is a bevel pinion, and *g* a bevel wheel; by means of which wheel and pinion the rotary motion of the machine is communicated to the horizontal shaft *h*, which again communicates the power of the machine to any machinery which it may be intended to work. *i i i* is a large bracket fixed to the wall or building *k k*; this bracket supports the shaft *e e*, while the bracket *l* carries one end of the shaft *h*. The perpendicular plane which passes through the parts represented in section in the elevation, figure 1, passes through the points *m m* in the plan figure 2. The top journal or bearing *n* of the main shaft has a number of collars on it; for, if there were but one collar, it would require to be made larger in diameter than the collars shown in figure 1, in order to get a sufficient quantity of bearing surface; but if the diameter of a collar be increased, the friction will be greater, as then the rubbing surface is more distant from the centre of motion; so, if a sufficient quantity of bearing surface is obtained by a number of collars, there will be less friction than if only one is used to resist the pressure. *q q* are holes through which the water escapes from the basin under the arms into the tailrace after it has left the machine. As the arms have a rotary motion, and the pipe *a a* is fixed to the building under it, there must be means provided to prevent the escape of water at the place where the main-pipe meets the arms. A contrivance suitable for this purpose is shown in figure 1: it

* Description of Messrs. Whitelaw and Stirrat's Patent Water-mill, with an Account of the performance of one of these machines, lately erected at Greenock; to which is added, Information on the subject of water-power. By James Whitelaw. 22 pp., with five engravings. London: Mechanics' Magazine Office, 166, Fleet-street. Glasgow: D. Robertson, 188, Trongate.

consists of a ring or projection round the underside of the aperture *c*, and of a part *p* turned cylindrical at the place where it fits into the pipe *a a*. A leather, similar to what is used in packing the large piston in a Bramah press, is inserted into the recess *w w*, turned inside of the top part of the pipe *a a*, in order to prevent the escape of water betwixt the pipe and the cylindrical part of *p*. It will now be clear that if the part *p*, and the ring on the underside of *c*, are accurately turned and ground upon each other at the place where they meet, the pressure of the water in the main pipe will act upon the under edge of *p*, and press it in contact with the projecting part round the aperture *c*, and in this way keep the joining of these parts water-tight. There is a flanch outside of *p*, with holes bored in it, to receive steadying pins fixed to the top part of the pipe *a a;* these pins are seen in figure 1; they prevent the part *p* from revolving, and are fitted so as to allow *p* to rise or fall. There is another use for the flanch round *p*, which is this: — A little rope-yarn is wrapped betwixt it and the main-pipe, to prevent the part *p* from sliding down whenever there is not a sufficient pressure of water in the main-pipe to support it. The pipe *a a* is bored out to receive the part *p*, which is fitted so as that it will slide easily up or down in the bored part. *r r r r* are the stay-bolts which support the arms. *s s* are valves, and *s t s t* are levers which work upon the centres *t t*, and form a connection of these centres with the valves. There is a lever on the top, and one on the bottom side of each valve. The rods *u u* form a connection with the levers *s t s t*, and the springs *v v v v*, fixed to the arms. The end next the valve of each jet-pipe (see figure 2) is a circle drawn from *t* as a centre; and each valve is curved to fit and work correctly upon the end of its pipe. The levers *s t s t* are adjusted so that the valves *s s* will work without rubbing upon the ends of the jet-pipes, in order to get quit of the friction as much as possible; but it is not essential that the valves should be correctly water-tight. It will be clear, that if the machine revolves so fast as to make the united centrifugal forces of the valves *s s*, the rods *u u*, the levers *s t s t*, and the springs, greater than the weight that will bend the springs *v v v v* to the distance shown in figure 2, the valves will recede from the centre of the machine till the force of the springs gets sufficient to overcome the centrifugal force of the valves, &c. Therefore, the centrifugal force will cause the valves to cover the ends of the jet-pipes, and so allow less water to escape, and thus diminish the force of the water on the machine whenever it goes quicker than the proper speed. If the springs are considerably bent or strained when the valves are full open, a very small increase of the speed of the machine will cause the valves completely to cover the ends of the jet-pipes, and when the ends of these pipes are closed, the water can have no power to turn the machine. From this it will be clear, that the machine can be made so that when it is doing very little work, it will not move at a much greater speed than it will when acting with its greatest power.

The new water-mill acts on a principle similar to that of the well known Barker's mill: but the arms are bent and otherwise shaped, so as to allow the water to run from the centre to the extremity of the arms when they are in motion, in a straight line, or nearly so, and in this way the disadvantages of carrying the water round with the arms, as is the case in Barker's mill, are got rid of.

The curve of the arms is such as to allow the water to run from their centres out of the jet-pipes, without being carried round by the machine, when it is in motion at its best speed. On this account, the rotary motion of the arms will not give to the water a centrifugal force. So the forces which work the new water-mill are simply the force of reaction, and the weight of a column of water of the same height as that acting on the mill, having the area of its cross section equal to the sum of the cross-sectional area of each jet-pipe. When the machine is standing, the one of these forces is as great as the other; but when it revolves so quick that the centres of the jet-pipes move at the same speed as that of the water flowing from them, the force of reaction ceases, as then the water falls from the jet-pipes without any motion, in a horizontal direction, for the machine leaves the water as fast as the acting column can follow it. When the resistance to be overcome is as great as will

balance the force caused by the weight of the water, there is still the force of reaction left to bring up the speed of the machine; and as the weight of the water remains the same, whether the machine is in motion or at rest, the force of reaction will carry up the speed till the centres of the jet-pipes revolve at a velocity the same as that of the water issuing from them before it ceases. Thus the machine, when its jet-pipes revolve at a speed as great as that of the water issuing from them, will give its maximum of effect, which maximum will be equal to the whole power of the water it uses; for, in the time a given weight of water is expended, in the same time the machine is able to raise as great a weight from the level of the centres of the jet-pipes to the level of the surface of the water in the lead. There is of course a small part of the power lost, most of which is that caused by the resistance which the water meets with in passing through the main-pipe and the machine. This portion of the force is very inconsiderable, as will be shown in the next paragraph; and, by making a slight alteration on some parts of the machine, this small fraction of loss may be still farther diminished.

A machine erected lately for Messrs. Neill, Fleming, and Reid, at their works, Shaws-water, Greenock, gives, when tested by the friction apparatus invented by M. Prony, 75 per cent. of the whole power of the water which works it. The power of the water is 79 horses, and the power of the machine is equal to that of 59.25 horses or 75 per cent. as now stated. Mr. Stirrat's water-mill of 2½ horses' power is the first that was made; it was tested in the same way as the above-mentioned machine, and the result of the experiment was equally favourable.

The following are some of the advantages which the hydraulic machine of Messrs. Whitelaw and Stirrat, has over an overshot water-wheel of the best construction. The new mill has a governing apparatus, which renders its motion as uniform as that of the best constructed steam-engine: when a part, or even the whole, of the machinery which it works, is thrown off at once, the variation in the speed is scarcely perceptible. The speed of the new machine is well suited for evey purpose: generally speaking, it can be formed to make the required number of turns in a given time, and on this account, intermediate gearing is done away with. There is little wear and tear on the parts of the new mill, for its weight is perfectly balanced by that of the water, thus taking away almost all friction, and consequently wear, at the rubbing parts: five of these machines are already in operation, and not a workman has been employed in any way at either of them since they were first set a-going, although one has been in constant use for nearly two years. The new machine takes up remarkably little room. No very expensive building or other erection is needed for the fixing of the new water-mill, and the cost of the machine itself is very trifling in every case, and especially on a high fall, where an overshot wheel, as also the building and excavation required for it, become enormously expensive. On a fall of very great height where to erect an ordinary water-wheel would be altogether out of the question, the new water-wheel may be employed to great advantage. The new machine may easily be made to rise or fall according as the water in the tail-race is high or low, and one form of it will work to very considerable advantage in tail-water. The best constructed overshot water-wheel will not, after the speed is brought up for ordinary purposes, give more than 70 per cent of the whole power of the water which works it; and the new machine, as has already been shown, gives 75 per cent., and it can be formed to give even a greater portion of the power of the water than this.

SOLUTION OF THE DISC PROBLEM.

Sir,—Pursuing some investigations lately on a particular subject, the conclusions arrived at having differed widely from the explanations—at least such as I have seen given, of this phenomenon—induced the necessity of doubting their accuracy, and ultimately led to the following solution. Should it suit your convenience to transfer it to your influential journal I shall feel obliged.

I am, Sir,

A Friend.

Solution.

The attribution of an attractive power

to a blast of air seems rather an innocent idea.

The explanation of Doctor Hare, of Philadelphia, amounts to no more than that the force of the blast should be augmented, according to the increased area of the disc compared to that of the tube. Thus he states: supposing the orifice of the latter as 1, and that of the former 8, the force of the blast necessary to remove the disc should be 64 times that of the first impulse. I beg leave, however, to inform the Doctor, that if it were six hundred and forty times, instead of sixty-four, he would not be able to blow off the disc; he might move or advance it further, but to remove it were in vain.

The experiment of Mr. Reynolds in the exhausted receiver, although hitherto regarded as conclusive against the theory that ascribed the cause to the atmosphere, will appear, when minutely examined, to have no destructive influence on this theory.

Thus, when the disc was placed in vacuo, and the air admitted, the first impulse of the blast raised the disc, which, how *light* soever, was nevertheless *heavier* than *nothing;* so the instant it was removed, the vacuum became exposed, which offering no *resistance,* the air rushed in *laterally*. Again, the space over the disc being also void, and offering no resistance, the *lateral* current rushed up there, when *all* became as *in plenum.*

The phenomenon is due to the atmosphere. This ought to have appeared sufficiently evident; seeing that, whether the disc were at top or bottom of the tube, the same result followed, the pressure or resistance of the atmosphere being equal on every side.

Let a cylinder be placed round the disc, open at top, through the bottom of which the tube is admitted; let the cylinder be wider than the disc, leaving it room to play; now apply a weak blast, and the disc will not be blown out of the cylinder, but let a blast sufficiently powerful to overcome both the resistance to the area of the disc, and the waste of the escape by the sides of the cylinder, under these circumstances the disc will be blown *out* of the cylinder, although it may still be held *over* the cylinder. What is this but the atmosphere? Again, let a segment of the arc of the disc be *loaded,* say with a bit of lead, and the blast applied in the ordinary way of the experiment, in this case the disc will *turn* over as on a hinge, and be blown off the tube. Surely those who attribute an attractive power to the blast *per se,* will not assert that a piece of lead could destroy such a formidable foe.

Leaving the matter now to the consieration of your able correspondents, I shall conclude by advising what seems to me likely to be productive of some slight benefit in many cases, namely, that the safety valves for steam boilers be attached by a hinge or pivot, as pointed out in the experiment of the loaded disc.

OMICRON.

Dublin, October 28, 1840.

IMPROVED METHOD OF ADJUSTING SUN DIALS.

Sir,—It sometimes happens that much inconvenience attends the adjustment of a sun dial to its proper position with respect to the meridian, suitable instruments not being at hand to make use of for that purpose. I beg leave, through the medium of your valuable Magazine, to recommend the following method of adjustment of a horizontal dial. This method I have found to be very convenient, as the principal part of the operation I have performed by means of the dial itself, is as follows:—Let the dial be placed in a horizontal position, the plane of the gnomon nearly in the plane of the meridian, not fastening it down, in order that it may be turned on its centre if required; then make a small notch on the edge of the gnomon, sufficiently low that the shadow of the notch may fall on the face of the dial at the times of observation, which will be best about three or four hours before and after noon. If the dial should have two centres, separated by the thickness of the gnomon, a notch must be made on both edges of the gnomon at equal distances from their corresponding centres. At equal intervals of time before and after noon, compare the distances of the distances of the shadows of the notches from the centres of the hour angles on the corresponding sides of the dial. If the distances be

not equal, the dial cannot be in its proper position. To remedy this, move the northern part of the dial if in north latitude or the southern part in south latitude (by turning it on its centre) towards that side where the distance is the least, at the same time examine whether the horizontal position has been disturbed, if so it can easily be set right by means of a common level, this being the only instrument required in addition to the dial. A few observations will be sufficient to adjust the dial to its true position, when it can be fastened down. The best time of the year to erect the dial in north latitude will be in the month of June, when the sun will be at its greatest northern declination, and when the shadows of the notches will remain a longer time on the face of the dial, and consequently will admit of a greater interval of time (before and after noon) between each observation, thereby making the differences of the distances more perceptible, which will be very desirable, particularly when the dial is very near its true position. The adjustment may be made at any other time of the year, beginning the observation as soon as the shadow of the notch falls on the face of the dial.

I am, Sir,
Yours respectfully,
J. R. Aris.

King Street, Stepney, 23rd Nov. 1840.

IMPORTANCE OF UNIFORMITY IN THE RATES OF RAILWAY CLOCKS.

Sir,—Of all the besetting sins of railway managers, *want of punctuality* is the greatest; to this cause may be traced nearly all the dissatisfaction so often expressed in the public prints, and to this cause alone is attributable the greater number of the serious and fatal accidents which have unfortunately been so rife, as to throw a sort of odium over this delightful and splendid mode of travelling.

The introduction of this system of locomotion, has made travelling more than ever a matter of calculation, and want of punctuality annoys the man of pleasure, and injures the man of business in no ordinary degree.

Railways are said to "annihilate both time and space;" this they can only do safely and satisfactorily by keeping time, and in order to accomplish this, more attention must be paid to the *time-keepers*.

While traversing one of the extensive lines a short time since, it came out on examination that only three of the clocks were together, and they were not right, nor did any one clock throughout the line indicate true mean time. The extreme variation amounted to *six minutes*, and when it is considered that at the ordinary speed of twenty miles an hour, this is equivalent to two miles of distance, the probable consequences of such a difference must be apparent. The rapid approach of a fast train, at a time when it was reckoned to be two miles off, might involve an awful sacrifice of life and great destruction of property.

It has been suggested that an illuminated clock at each station should exhibit the time of departure of the preceding train, but before time-pieces can be safely depended upon, more pains must be taken to obtain uniformity of rate, than has hitherto been done.

It would seem to be worth while to employ chronometers of the best construction for this purpose, but as the number required is great the expence might be an impediment; it is well known, however, that well-made clocks, with proper attention,* can be made to preserve a sufficient degree of uniformity, and I would earnestly call the attention of railway officers to this matter. Punctuality in the performances both of the men and machinery, are of vital importance to the prosperity, nay, even to the very existence of railway communication.

I am, Sir, yours respectfully,
Wm. Baddeley.

London, Nov. 27, 1840.

AQUATIC CLOTHING—PRESERVATION OF LIFE FROM DROWNING.

Sir,—Much has been said of the Aquatic Life Hat, a notice of which has appeared in your Magazine. It is said to be "adopted by the Deal boatmen;" one hat is also stated to be "capable of supporting four persons in the water,

* A competent person sent down the line once or twice a week, to detect and correct any variation would, I appehend, ensure the required uniformity.

and if attached by a string to the coat, and the wearer should fall into the water and sink, his hat would float and show where he would be found."

It is well known that the human body is very little heavier than water, and that any person with his nose, eyes and mouth above water (all other parts being immersed) by keeping his chest inflated as much as possible, will float; it cannot, therefore, require many cubic inches of atmospheric air to render a body buoyant. These considerations induce me to bebelieve, that instead of the "Aquatic Life Hat," greater security would be obtained if the fourth part of the air it contains were attached to the person in a different manner; it might be placed either inside the cravat, underneath the coat collar, or in the room of coat padding, or partly in each of these ways.

By this arrangement, a person falling into the water, instead of his hat on the surface, *would show us his head;* he would have full liberty to breathe, and would float until assistance arrived.

The Macintosh cloth is now made of very thin muslin, and so extremely light, that the desired quantity might be easily concealed in the dress as I have stated; it could also be applied to female use, by inflating the central parts of boas, or in the form of collars, small scarfs, &c., covered with some fashionable material to be worn either upon, or underneath a cloak or shawl.

I am, Sir,

Your most obedient servant,

H. WALKER.

20, Maiden-lane, Wood-street. Nov. 12,1840.

TEMPERATURE OF THE POLAR REGIONS—(NEW THEORY OF THE UNIVERSE, VOL. XXXII. P. 555.)

Sir,—Whether the Polar Regions are occupied by land or sea, appears to be a question that cannot, at present, be answered. There is another question which, although also unanswerable as yet, it may be interesting to ask—namely, what is the temperature of the climate at and near the Poles? We know that currents of heat continually flow from the equator towards the north and south. What must be the effect where the currents unite at each Pole? It is possible that there may not only be land, but land with a warmer climate than our own, and that the undecomposed elephants thrown on the Siberian coast may have been carried there by a flood from the Polar land. Such a circumstance would not be improbable, according to my "New Theory of the Universe."

Leaving this question for the present to the consideration of those who have more means of investigation on this subject than I can ever possess,

I remain, Sir,

Your obliged

E. A. M.

October 29th, 1840.

HAWKINS'S RHODIUM PEN.

Sir,—Will you, or any of your correspondents, inform me of the real merits of Hawkins's patent pen? I believe Sir John Robison stated at the recent meeting at Glasgow, that he had used one eight years, and still found it unimpaired. If this statement be correct, it is really a valuable acquisition to any one having much writing to do. I am desirous to have *practical information* on the subject, and shall be glad also to know its price, and where it can be procured. Trusting to your invariable disposition to afford information on every useful subject,

I remain, Sir,

Your most obedient servant,

PLUME.

Manchester, Nov. 23rd, 1840.

[Our correspondent has been misinformed as to the number of years the pen had been in use; Sir John Robison's statement was, that he had used it for *four* years, not *eight*. We believe, however, that pens of this description have been before the public near seven years, and we have heard it asserted by Mr. Hawkins, the inventor, that there is not an instance of one showing the commencement of wear, although many have been in constant use during the whole of that period. Mr. H. confidently states his belief that one pen will endure more than a hundred years of daily use. They are sold by Mr. Lund, of Cornhill, and Messrs. Roake and Varty, of the Strand, London.—ED. M. M.]

ON THE COURSE OR PATH OF THE ELECTRIC FLUID.—BY HENRY DIRCKS, ESQ.

Read before the Literary and Philosophical Society of Liverpool.

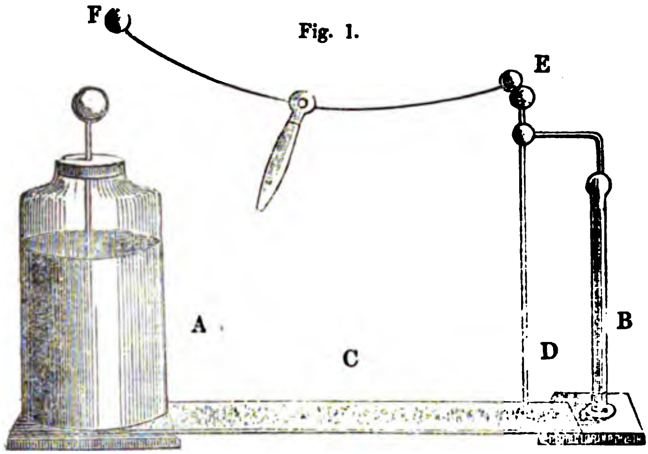
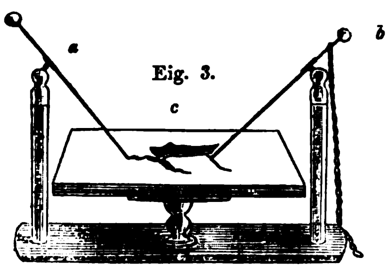


Fig. 1.

Fig. 2.



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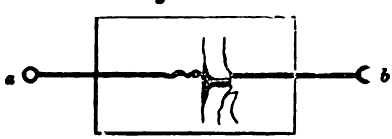


Fig. 4

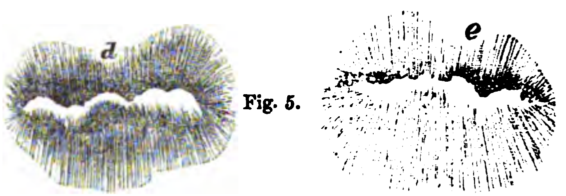


Fig. 5.

Although we have two principal theories by either of which we may account for electrical phenomena, yet as is well known there is no theory that is universally adopted. We prefer that of Du Fay of two fluids, the resinous and vitreous, whereas in America the Franklinian theory of a single fluid continues to be received. It is certainly a curious and remarkable fact that this important point, which appears to be at the very head of our enquiry in investigating the nature of this exceedingly subtle agent, should have so long withstood every effort that has been made to develope its operation, and that with our extended means of pursuing this interesting investigation, philosophers should still remain divided in opinion. We agree that it is the same agent which is at work in atmospheric, frictional, magnetic, voltaic, organic, and thermo-electricity. The same data are taken up by the favourers of either theory to prove their several positions; the influence of *points* is alike advanced to prove the existence of one and of two fluids. Franklin, and all electricians after him, speak of the star and the brush, the former negative, the latter positive; whereas Dr. Faraday contends, that under favourable circumstances, and especially in some gases, the negative and positive points both afford the electric brush of light. We

are all familiar with the experiments proposed as evidence of the existence of a single fluid, as the action of a flame between two balls, one positively the other negatively electrified, by which the latter becomes very much heated; the stream of air produced when a point proceeds from a conductor; the manner of charging the Leyden phial; and especially that given by Mr. Lullin, when the discharge of a jar is made to perforate a varnished card, between two points on either side, but half an inch asunder, by which the point proceeding from the negative side invariably perforates the card, although a hole may have previously been made opposite the positive point, where a perforation does not otherwise occur; also the common discharge through a card placed against a charged jar, where a burr is produced on both sides, but more markedly if the card is set vertically between the points of the universal discharger, when the burr will be found larger on the negative side, where the positive electricity may be supposed to make its exit, and smaller on the positive side, the outlet for the negative or resinous electricity. The appearances by perforating bodies might at first seem conclusive that there are two fluids, but it has occurred to the writer, and may be worthy of notice here in explanation of the double burr, though he has never met with any notice of a similar view of this subject being taken by others, that, as the electric fluid is so readily excited by friction pressure and slighter causes, the electric discharge itself, by its amazing rapidity, may become the exciter of a quantity of the fluid previously latent, which being wrought into activity, a reaction may be thereby produced, and this whether there is one or two fluids. This seems to be both a reasonable and highly probable consequence.

We here have instances of the effects of the electric fluid, but can neither arrive at any conclusion respecting its nature, nor ascertain the direction of its course. As we might hope to arrive at something more conclusive by considering this latter point, which indeed is the main object of the present paper, we shall proceed to this more important enquiry.

One known means of tracing the passage of the electric discharge, is that made, when the points of the univeral discharger, are placed an inch apart on a card having a broad line painted on it with vermillion, when the discharge leaves a well defined irregular black line. Observation in this way, however, is very limited. We wish to arrive, for instance, at something definite, whethe there is one or two fluids; and we wish to see in the path it takes whether it passes right over, meets halfway, or passes side by side. In short, what are the peculiarities exhibited by the discharge of the Leyden jar?

Dr. Faraday, in his most excellent and elaborate "Researches," states that an ever present question on his mind has been—"Whether electricity has an actual and independent existence as a fluid or fluids, or was a mere power of matter, like that we conceive of the attraction of gravitation?" "If determined *either way*," he adds, "it would be an enormous advance in our knowledge." Not only every experiment which has for its object the elucidation of electrical phenomena, but likewise the opinions of electricians, may truly be said to be of extreme value. It is well, therefore, that Dr. Faraday has put on record as well in what he succeeded as in what he failed. The ill success of one may suggest another course of experimental enquiry to some other worker in this prolific field of scientific research, and thus we may hope gradually to develope many important results in connection with electrical science, from which, with good cause, we expect to reap many discoveries of great practical benefit.

It early appeared to me quite within the range of possibility to render this active fluid a tell-tale, as it were, of its own progress, especially in conducting the discharge of the Leyden battery. I felt convinced of this from what has already been noticed of the piercing of cards, the black line left on a vermillion coloured card, and also from the markings left on the uncoated glass by the spontaneous discharge of an overcharged jar. But my object was to obtain evidence on a larger scale, and of a more conspicuous character.

My first experiments were made with a piece of window glass 4 inches square smeared on one side with a mixture of flower of sulphur and white lead ground together with gum water, laid evenly on the glass and dried. When placed against the side of the Leyden jar, the

charge may be passed over it by using the discharging rod, in which way a dark brownish line, 2 or 3 inches long having a circuitous course is easily produced.

Not satisfied with this result, I at length adopted a plan which successfully affords an interesting illustration of the path of the electric fluid through a considerable space, varying with the quantity of charged coated surface. From 18 inches to 2 feet is easily obtained with a gallon jar, or battery of equal capacity, provided the electrical machine is in good working order. The means of effecting this will appear very simple, though the conditions requisite for its success are not so obvious as might at first appear. Take a broad oblong plate of glass, place under it a sheet of white paper, then by striking a fine hair-sieve containing iron filings let fall on the glass an equal distribution of the filings until they communicate a dark-grey shade over the paper. The glass so prepared is to be placed in the line of communication for marking the discharge. When this is done with the white paper under the glass, the result is most conspicuous, beautiful and interesting. The appearance that instantly follows is something like a map of a serpentine river, with often small branches issuing out in many streams at some of its principal windings, and again running into the main branch. Throughout the tortuous course of this passage the iron filings are swept away to the breadth of ⅛th to ¼th of an inch and upwards by the rapid transit of the fluid, with as much neatness and precision as if carefully removed by some process requiring extreme care and delicacy of manipulation (see fig. 2). Often a few grains form an irregular central line. If a short piece of crooked wire in the form of a ring, arch, or helix, be placed in, or a little out of the direction of the fluid, it is made part of the circuit and the filings are not disturbed if any arched form or immediate connection offers a more perfect conductor. On shaking the filings off the glass no trace appears to remain, until breathed upon when a clear thread like having a slight dark colour becomes distinctly observable.

The success of this experiment seems to depend on a peculiar arrangement, and the best I have found is to have the Leyden jar placed on the edge and touching the filings at one end of the glass plate; a perpendicular rod of thick wire being at the other, from the top of which, a connexion may be made (by a discharging rod,) with the ball of the Leyden phial (see fig. 1). A full charge is requisite to make a good working of the path and the filings should not be two thickly spread, otherwise the electricity passes over in flashes; a communication too should be made between the outside of the jar, and some good conductor. The vertical pillar at the further end of the plate has been found to answer when long thin bent wires proved quite ineffectual.

It is only to be regretted that this beautiful experiment leaves the subject still open to enquiry, but this may be one step, which in other hands may be made serviceable in obtaining greater results. I cannot pass over in this place mentioning a very easy means of tracing, and so registering the several experiments made at each discharge. This is done by taking the glass, strewed with filings, and having a marking which is to be copied; on each end, or down each side, place a thin lath, on this lay another, but plain glass of equal size, over all place a slip of paper long enough for a tracing. Now rest the glasses between two tables set apart, or between two flat bars of wood resting on a table, and in such a situation, that a small lighted candle placed on the floor will throw the shadow of the filings up through the glass on the back of the paper. There being no other light in the room this is easily done. Or by giving a coating of thick glue to cartridge paper, this, if carefully managed, would take up the filings of the glass, and show a reversed specimen of the electric path. In this way I have taken up the filings and preserved the figure made by the magnet.

Another experiment, too interesting to be omitted, was performed with a few sheets of strong printing paper stitched like a pamphlet. In the first experiment made with this, it was laid on the table of the universal discharger, and the balls being removed, the blunt pointed wires were placed on the paper an inch and a quarter asunder; the discharge of a very large jar, slit the paper, giving it the form of two small folding doors (figs. 3 and 4). With a mixture of equal parts of flower of sulphur and red lead, the face

of the upper and three lower leaves were strewed over. The result on making the discharge was not always the same—thus:

Experiment 1. In a passage of 1¼ inch the positive end was harmlessly passed over for more than ⅓rd, leaving a dark line on the top leaf; from hence to the negative end the paper was ripped open, the cut being in shape like the letter H. On examining the lower or second leaf, the remaining two-thirds of the passage, that is, the horizontal line of the H presented a broad black marking, which had stuck also to the under side of the upper leaf. The third leaf was untouched.

Example 2. This was precisely the same as the foregoing, with the exception of being a shorter path and more violently torn, so that the rent formed a very oblong H, and the positive side was uninjured for near half-way. The remaining half, which we call the negative side, showed a broad black band on the face of the second leaf.

Example 3. This passage was remarkable from the paper being pierced on the positive side, clear of the rent beyond it, which was of a very imperfect H form. The paper was unmarked and uninjured for one quarter of the path on the positive side at the end of which the paper was pierced with a small hole. On the second leaf a round black spot occurred corresponding with this terminus of the positive side, and at the negative end where the rent begins there was another black spot or star, both connected by a straight cut in the paper, not discoloured, and branching off right and left at the negative end, in form like a T. The third leaf not marked.

Example 4. Here the passage from the positive was marked ⅓ with a faint line, at the end of which a small hole appears, and another hole at the commencement of the negative passage, without tearing the paper. On the second leaf these holes have corresponding black perforated spots, and on the third leaf there is a broad black mark, fig. 5 *d*, with a corresponding one, fig. 5 *e*, on the upper side of the leaf above it. These black marks are all very like the representations of mountains in a map, and have a white band running through their centre.

Here, as in Mr. Lullin's experiment, there is a tendency on the negative side to enter the paper although its surface is covered with a conducting substance. There is more violence too on this side, where, indeed, we have a disruptive discharge. These experiments are, on many accounts, exceedingly interesting. It would appear as if the positive or vitreous electricity had greater velocity than the negative; that the two electricities meet at this point, and uniting cause an explosion followed in this instance by a chemical effect—the production of a sulphuret of lead, which marks *only* the remaining two-thirds of the path. This, if correct, would seem to offer some modification of the remarks Dr. Faraday makes on the current. He says, "It is a most important part of the character of the current, and essentially connected with its very nature, that it is always the same. The two forces are *everywhere* in it. There is *never* one current of force or one fluid only. Any one part of the current may, as respects the presence of the two forces there, be considered as precisely the same with any part; and the numerous experiments which imply their possible separation, as well as the theoretical expressions which, being used daily, assume it, are, I think, in contradiction with facts." What he next adds is too remarkable in connection with our experiments not to call for special notice. "It appears to me to be as impossible to assume a current of positive or a current of negative force alone, *or of the two at once with any predominance of the one over the other*, as it is to give an absolute change to matter." [1627.] The establishment of this as a fact, or its disproof, he justly considers of the utmost importance.

We might almost be inclined to inquire in reference to the electrical experiment, from the consideration of which we have digressed—Has the resinous electricity a tendency downwards and the vitreous a tendency upwards? Or has the latter greater velocity than the former? Or do these experiments at all prove "that the centres of the two forces (or electricities), or elements of force, can be separated to any sensible distance?"

November, 1840.

Description of Engravings.

Fig. 1, the arrangement of the apparatus. A the Leyden jar; B an upright

glass pillar mounted with a ball and wire, supporting the vertical thick metal rod D E; E F, the discharging rod to complete the connection; A C D, the glass plate strewed over with iron filings.

Fig. 2, the same glass plate as above, but with the marking left by the discharge.

Fig. 3, a few sheets of strong printing paper, stitched at the back, and placed between the wires of the universal discharger, *a* being the positive, and *b* the negative side. The paper is not torn except close to *b*, and a short distance from *a*.

Fig. 4, shows the positive electricity entering at a small hole, which it has pierced a little in advance of the torn paper which lies on the negative side.

Fig. 5, the result of the 4th experiment with the arrangement fig. 3, in which a sulphuret of lead was formed on the third leaf of the paper.

MR. SANKEY'S DEMONSTRATION OF THE THEORY OF PARALLELS DEDUCED FROM THE ASSUMPTION OF ONE RECTANGLE.

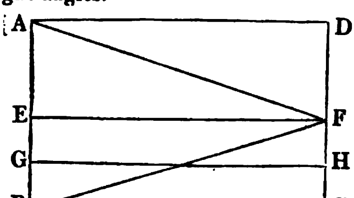
Sir,—In the *Mechanics' Magazine* for the 26th of April, 1840, I stated, that "if the theoretical formation of *any* one *rectangle* can be demonstratively proved, the doctrine of parellels will be completely established by taking multiplies of the rectangle *ad infinitum, &c.*"

As *some* of your readers perhaps may not be able to make out the proof of this for themselves, I am induced to offer the following demonstration:—

Lemma 1.

In any Rectangular Quadrilateral the opposites sides will be equal.

Let A B C D be the given quadrilateral whose angles at A, B, C, and D are right angles.



Bisect the side A B in E; at E erect E F perpendicular to A B, cutting D C in F, since by 17 Prop. Book 1st, it cannot meet either of the sides A D or B C. Join A F and B F; then, in the two triangles, A E F and B E F, we have two sides in the one equal to two in the other, namely, A E = B E and E F common; also the contained angles at E equal as being right angles; therefore, the remaining angles are equal, as also the side A F = B F. Therefore, in the triangles A D F and B C F, we have now one side and two angles equal; viz. A F = B F; the right angles at D and C equal; also, subducting the equal angles E A F and E B F from the right angles at A and B, the remaining angles D A F and C B F are equal; therefore, by the 26th Prop. Book 1st, the remaining sides and angle are equal; consequently, the side A D = B C, the opposite sides of the given quadrilateral. In like manner it can be shown that the side A B = its opposite, D C. *Q.E.D.*

Cor. 1. Since the angle E F A = the angle E F B and the angle A F D = the angle B F C; therefore, their sums E F D and E F C are equal, and consequently, right angles. Also, F D is equal to F C, therefore, the perpendicular E F, bisecting the side A B, bisects also its opposite C D perpendicularly.

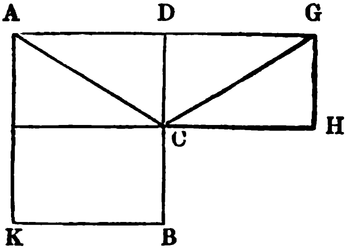
Cor. 2. As E F C B is also a rectangular quadrilateral, it can be shown in like manner, that the bisecting line E F = either side A D or B C. Bisecting E B again in G, and raising the perpendicular G H, this bisecting line G H will also be equal to the side B C, so that by constant bisections pursued *ad infinitum*, it can be shown in general, that a perpendicular raised at *any* point to any of the sides A B or A D, and meeting the opposite sides C D or B C will cut them perpendicularly, and be equal to B C or C D, the sides opposite to these perpendiculars. These perpendiculars will also intersect one another at right angles, and form new *rectangular* quadrilaterals with the sides of the given quadrilateral and with one another.

Lemma 2.

Supposing any Rectangular Quadrilateral to be formed, a Rectangular Quadrilateral can be obtained whose sides shall be greater than any given.

Let A D C B be the given rectangular quadrilateral, produce A D to G, so that G D = A D, and B C to H, so H C =

B C, join G H; then, I say, A B H G is

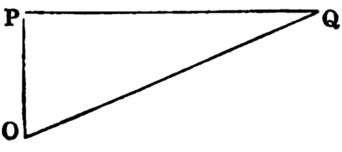


also a rectangular quadrilateral. For join A C, G C; then in the two triangles A D C, G D C, we have two sides in the one equal to two sides in the other A D = G D and C D common, also the right angles at D equal: therefore, the side A C = G C, and the remaining angles are equal, consequently, in the triangles A C B and G C H, we have also two sides in one equal to two in the other, viz., A C = G C and B C = H C and the angles between A C B (= D C B —A C D) = G C H (=D C H—D C G), therefore, the remaining angles are equal; and the angle at H = the angle at B = a right angle; also the sum of the angles at G = the sum of the angles at A = a right angle. Consequently, the figure A B H G is also a *rectangular* quadrilateral whose opposite sides are therefore equal, which can be doubled again and again, till the side A G′ exceeds any given line. In like manner also the other sides A B and D C can be produced to K and I, and a *rectangular* quadrilateral A D I K be formed, and so on *ad infinitum* till the side A K′ exceeds any given.

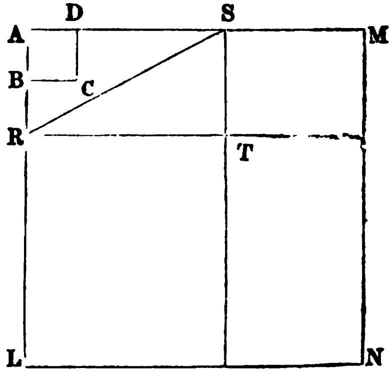
Proposition.

The angles of any *right angled triangle are equal to two right angles.*

Let O P Q be the given right angled triangle; let A B C D be the rectangle, which is assumed to have been formed; take multiplies of it as above, till we ob-



tain a rectangle A L N M, whose sides A L, A M shall be greater than O P, P Q the sides of the given right angled triangle; then in A L and A M take A R=



O P and A S = P Q, join R S and the triangle A R S=the given triangle O P Q, two sides of the one being equal to two in the other and the contained angles right angles. At R and S erect perpendiculars to the sides A L, A M and intersecting one another at T, where, by Cor. of Lemma they will cut one another at right angles; consequently, the quadrilateral A R T S will be a rectangle, and its opposite sides equal; therefore the right-angled triangles R A S and S T R are equal, and the angle A S R= angle S R T; therefore, the sum of the angles A S R and A R S=the angle A R T = a right angle. Therefore, the three angles R A S + A S R + S R A = two right angles; consequently, the sum of the angles of the given triangle O P Q also = two right angles. *Q. E. D.*

Cor. In *any* triangle the sum of the angles are equal to two right angles. Let fall perpendiculars on the side which lies between the two acute angles, then the triangle will be resolved into two right angled triangles, and the sum of the angles of each will be equal to two right angles. Consequently, the sum of the angles of both together will equal four right angles, from which deducting the two right angles at the perpendicular it will leave the sum of the angles of the given triangle equal to two right angles. *Q. E. D.*

N. B. From the 17th Prop., it follows that there must be always two acute angles in every triangle.

I am, Sir, yours, &c.

WILLIAM S. VILLIERS SANKEY, M.A.

COMPARATIVE FITNESS OF BLACK AND WHITE PAINT.

Sir,—As you were so kind, in noticing my communication, to insert the article on black paint by Mr. Kenning, I beg leave to hand you that part of the article, Painting (*Penny Cyclopædia*), which treats on the same subject; as, although the authors differ, they may both be right; and although black paint may be injurious in hot climates, it may be more durable than white in temperate ones. If you can find room for these remarks, and the enclosed quotation, in your most useful Magazine, you will much oblige yours,

Respectfully,
W. H. James.

P.S.—If black is worse for wooden, it may be best for iron vessels, even in hot climates, so that the subject deserves investigation.

Queen-street, Camden-town, Nov. 23, 1840.

"It is a generally received opinion among painters, that white lead is the best material for painting work of all descriptions, with a view to its preservation, and they affirm that black is useless in that respect. Now, presuming that the durability of paint depends on the insolubility of the materials used in its composition, we might infer that black, which is composed of one of the most imperishable bodies known, namely, carbon, in the state of lampblack, is more durable than white, which is made of carbonate of lead, a substance slightly soluble in water; and the following facts confirm this. To be able to judge fairly, we must have black and white of the same age equally exposed, and on the same material. These conditions are all fulfilled on finger-posts and other public notices exposed by the highways and on wooden grave-rails in country churchyards, which are almost invariably painted and written either black and white or white and black. Those with black grounds and white letters may often be seen with merely the illegible remains of the inscriptions, while the ground is quite perfect. But the black writing frequently remains not merely till the white ground is washed away, but often till the surface of the wood, except where it is occupied by the letters, is decomposed to the depth of more than a sixteenth of an inch, actually leaving the inscription in relief; and although most general rules are said to have exceptions, the writer has never met with one to this."

ON THE ACTION OF STEAM AS A MOVING POWER IN THE CORNISH SINGLE PUMPING ENGINE.—BY JOSIAH PARKES, M. INST. C. E.

In this communication the author presents a detailed analysis of some of the facts collected and recorded by him in his former communications, with the special object of ascertaining from the known consumption of water as steam, the whole quantity of action developed—the quantity of action had it been used unexpansively—the valve of expansion—the correspondence between the power, and the resistance overcome—and, finally, a theory of the steam's action, with a view of determining the real causes of the economy of the Cornish single pumping engine.

The data employed for the purposes of this investigation are those obtained from the Huel Towan engine by Mr. Henwood, from the Holmbush by Mr. Wicksteed, and from the Fowey Consols, and recorded in the author's communications in the Transactions of the Institution of Civil Engineers, Vols. ii. and iii.

Steam may be applied in one or other of the two following modes:—Expansively, that is, when admitted into the cylinder at a pressure greater than the resistance, and quitting it at a pressure less than the resistance; or unexpansively, that is, when its pressure on the piston is equal to the resistance throughout the stroke. By the term *economy* in the use of steam, is meant the increase in quantity of action obtained by the adoption of that mode which produces the greatest effect.

The weight of pump-rods, &c., which effects the pumping or return stroke in a Cornish engine, is greater than the weight of the column of water, by the amounts necessary to overcome the friction of the water in the pipes—to displace the water at the velocity of the stroke—to overcome the friction of the pitwork, and of the engine itself. The absolute resistance opposed to the steam, consists of the weight which performs the return stroke, plus the friction of the engine and pitwork, and the elasticity of the uncondensed steam.

The water-load in the Huel Towan engine was very accurately ascertained as 11 lbs. per square inch on the piston; and it is shown that the additional resistance amounted to 7 lbs. in the Huel Towan, and to 6 lbs. in the other engines, so that the whole resistance in the Huel Towan engine is 18 lbs. per square inch of the piston. Now, the elastic force of the steam at the termination of the stroke, and before the equilibrium valve is opened (ascertained from the ratio of the volumes of steam and water consumed), is only 7 lbs. per square inch, that

is, 4lbs. less than the water-load alone. The corresponding results for the other two engines are equally remarkable, and show most distinctly that, at the termination of the stroke, the pressure of the steam is far below the water-load, as had been previously observed by Mr. Henwood and others.

The next step in the analysis is to determine the portion of the stroke performed when the pressure of the steam in the cylinder is just below the resistance, and then to separate and estimate the spaces through which the piston is driven respectively by steam of a pressure not less than the resistance, and less than the resistance. These facts being ascertained, the virtual or useful expansion, and the dynamic efficiency of the steam, during the two portions of the stroke, are known; and it appears that there is a deficiency of power, as compared with the resistance overcome, of above 3lbs. in the Huel Towan, and more than 4lbs. in the other engines, per square inch on the piston.

From these startling facts, and a careful examination of Mr. Henwood's indicator diagrams, the author was induced to inquire whether the piston had not been impelled by a force altogether distinct from the continuous action of the steam upon it, namely, by a force which is to be referred to the sudden impact on the piston when the admission valve is so fully and instantaneously opened, as it is in these engines, and a free communication established between the cylinder and the boiler. To this instantaneous action on the piston, the author, for the sake of distinction, assigns the term *percussion;* and, proceeding to analyse the authentic facts under this view, it appears that the space of the cylinder through which the piston was carried by virtue of this percussive action was about 21 inches in the Huel Towan, 27 inches in the Holmbush, and 33 inches in the Fowey Consols engines.

The results thus unfolded, which are facts independent of any hypothesis, appear less startling on a full consideration of the circumstances under which the steam is admitted into the cylinder. The engine has completed a stroke, and is brought to rest by the cushion of steam between the piston and the cylinder cover; a vacuum is formed on the other side of the piston; the elastic force of the steam in the cushion then nearly balances the resistance. A communication is now suddenly opened between the cylinder and the boiler containing steam of a high elasticity; and the piston, being ready to move with a slightly increased pressure, receives a violent impulse from the steam's instantaneous action. The piston having started, the influx of the steam is more or less retarded by the throttle valve, and its elastic force, though at first greater than the resistance, is soon reduced considerably below it, the mass of matter in motion acting the part of a fly-wheel, absorbing the excess of the initial power over the resistance, and discharging it by degrees until the stroke is completed.

The indicator diagrams, which are the transcripts of the piston's movements, show that such may be the nature of the action on the piston, and the discussion of numerous well-established facts and phenomena, for the Cornish engines, strongly confirms this view of the case. Whatever may be the theory of the steam's action, the fact that the sum of those actions has carried the piston through its course, is certain; and it seems equally certain that the quantity of water as steam which entered the cylinders was insufficient alone to overcome the resistance.

The author then investigates the amount of useful action due to the steam imprisoned between the piston and the cylinder cover, and recovered each stroke, which, for its use in bringing the engine to a state of rest at the end of the return stroke, he terms the *cushion.* This quantity, though small, is appreciable, and its value is assigned for each engine.

The author treats, lastly, of the evidence furnished by the diagrams of the indicator, and of its utility as a pressure gauge. The communication is accompanied by elaborate tables of the results of the analysis, and an appendix with the calculations worked out in detail.—*Trans. Inst. Civ. Eng.*

ELECTRICITY OF STEAM.

A curious, and probably a most important, discovery in this branch of natural philosophy, was made about a fortnight ago, in a boiler attached to a hauling engine, at Seghill, on the Cramlington Railway, near Newcastle. The engineman on attempting to lay hold of the lever of the safety valve, received what he describes as a severe blow, which nearly caused him to fall; he, a second time attempted it, and received a similar blow. This having been made known, an examination of the boiler followed, and it was found that the steam which was escaping from a "*blower*" near to the safety valve, was highly charged with electricity. Our informant states that on himself placing one hand in the steam, sparks upwards of half an inch in length were emitted from the other, and this whilst he stood upon the masonry which was surrounding the boiler: so that had he been upon a glass stool the effects would have been much greater. We are glad to hear that this discovery is being followed up by experiments on other boilers; when the discovery was made, it was considered by many to be owing to the quality of

the water used, which was pumped from the coal mine; subsequently, however, on trying the steam from a locomotive engine on the Newcastle and North Shields Railway, a great quantity of electricity was obtained, and the water used in this case was from the River Tyne. The subject is highly interesting, and we hope that the discovery may lead to useful results; the explosion of boilers has hitherto baffled research, and it is not improbable that elasticity is intimately connected with it.—*Gateshead Observer.*

We were the first to announce the recent discovery of the existence of electricity, to an enormous extent, in the steam discharged from steam-engine boilers, and we are now the first to lay before the public a satisfactory explanation of that singular phenomenon.

Since we first noticed the subject, experiments have been actively prosecuted by Mr. W. G. Armstrong, of Newcastle, in conjunction with Mr. Robert Nicholson, the engineer, upon the locomotive engines of the Newcastle and North Shields Railway; and which have led to the conclusion that the electricity is developed by the *condensation* which takes place when the steam escapes into the air.

Our informant, who was present, and took part at most of these experiments, furnishes us with the following particulars and observations:—

When the steam was discharged through a tube composed of hollow glass rods, connected together with brass stop-cocks, none of the cocks, except the last one, or that from which the steam issued into the air, indicated either negative or positive electricity. The steam, therefore, could not possess *free* electricity *in the boiler;* for if it did, it would have imparted its positive electricity to all the cocks through which it passed on its way to the discharging orifice. Neither could the electricity be acquired *by friction* in the tube; because, in that case, the steam would have absorbed the natural electricity of the cocks, and rendered them *negatively* electrical.

The air in the vicinity of the jet of steam yielded *positive* electricity; whereas, if the steam had acquired its electricity by *expansion*, or other mechanical process, operating on its escape from the orifice, the adjacent atmosphere would have been deprived of its electricity, and made *negative*. Everything, therefore, but *condensation* was disproved; and that condensation should really be the cause of the phenomenon, is perfectly consonant with reason; since it has long been known, that electricity is taken up in evaporation, and given back in condensation, although the *extent* of the electrical disturbance has hitherto been supposed to be very small.

A pointed wire, passed into the steam, through a glass tube inserted in the boiler, drew off no electricity; which furnished an additional proof, that *active* electricity did not exist in the steam within the boiler. Upon insulating the boiler, it became *negatively* electrical, proving an absorption of electricity by the steam, and thereby corroborating the explanation just given of the phenomenon.

By collecting the electricity from a copious jet of steam, by means of a great number of pointed wires, effects were produced equal to those of an unusually powerful electrifying machine. Sparks of no less than 4 inches long were obtained in rapid succession; and in the experiments in which the glass tubes were employed, the most beautiful and singular coruscations of electrical light were exhibited.—*The Gateshead Observer.*

SURFACE CONDENSATION—AND ON THE PROPER USE OF STEAM EXPANSIVELY.

Sir,—In pursuing the subject of surface condensation, I will not pretend to enquire as to whom the chief merit of the system is to be ascribed. Certain it is, however, that several individuals have adopted the principle for years, and steam ships have long been working with condensers composed of copper tubes, other than Mr. Hall's, of which I am myself cognizant. By these observations I do not mean to detract from the merit due to Mr. Hall; on the contrary, I am only speaking to facts; for to that gentleman, of whom I know nothing beyond what I gather from the public prints, must be conceded, at all events, the praise of most indefatigable and praiseworthy endeavours to bring this valuable system into general use, as well as great skill in its management. If there should be errors, which I confess I do not see—and where, allow me to ask, is the most profound thinker that does not commit them occasionally—it affords no reason why a man's honesty of purpose should be impugned on that account.

The common condenser is composed of a chamber, into which the steam passes from the cylinder, and coming into immediate contact with the "injection," a body of cold water flowing in in a continuous jet, a very large portion is instantly deprived of its power, and the water resulting from the operation; also the remaining vapour, to an extent, is withdrawn therefrom by the air pump.

The surface condenser is composed of a large number of small copper tubes, about 8 feet long individually, placed at a small

distance apart in a vertical position, having their open ends inserted, air tight, into a chamber perforated to receive them both at the top and at the bottom. The condensing water is passed through, this body of tubes enveloping their whole exterior surface, while the steam from the cylinder is received into the top chamber, and spread so as to enter the whole simultaniously, the bottom chamber receiving the water resulting from its condensation, whence it is extracted by an air pump in the usual manner.

The elasticity of the remaining vapour, by either mode, will vary with the difference of "temperature" of the water, and likewise with "that" of the steam, as well as with the "quantity" of the one compared with the other. Therefore, if a better vacuum is obtained by surface than is usual by injection, and which there exists no reason for doubting, both from a greater body of cold being exposed, and from the absence of the air carried into the "common condenser" by the injection, it is, I presume to think, pretty strong evidence that the system must be efficient.

But it may be said, that notwithstanding a better vacuum is shown, the "time" taken to effect it more than counterbalances the benefit derived. Now though the chief evidence opposed to this at present, for aught I know, may be what the gauge furnishes, yet I think even that instrument affords sufficient to satisfy any candid, unbiased mind. Supposing, for instance, the vacuum in the condenser were a perfect Torricellian, and the mercury of the gauge attached to the bottom chamber to remain "stationary," notwithstanding the discharge of steam from the cylinder at every stroke, this would be proof positive that the condensation was effected with a rapidity equal to the velocity of the steam rushing into a vacuum, as it never reached the gauge; and no mode of condensation, be it what it may, can clear a cylinder more speedily. But as vapour, of greater or less density, according to the degree of vacuum obtained, is at all times present, it follows that, however attenuated such vapour may be, its compression by the rush of steam from the cylinder must be perceptible by its action on the mercury in the gauge, the extent varying with the density, and which indeed is always the case; but it does not follow that the condensation is performed less instantaneously or perfectly on that account, than in the hypothetical case above. To judge of this, we must attentively observe the gauge (if there be no indicator), and if the recession of the mercury differs nothing materially from the rapidity of the rise, we may conclude that it is performed like the above, in the shortest possible space of time. On the contrary, if the mercury rises (I am assuming it to be Bedwell's gauge) to a greater extent than is due to the density of the permanent vapour, and its return is comparatively sluggish and slow, it is evident that too much "time" is occupied in the operation, and the effective power on the piston is, of course, neutralized in proportion.

Hence we are justified in concluding, at the mercury in the gauges of the *British Queen* remained "steady" (not "stationary") having but little motion, without even a reference "to the difference of vacua," that the permanent vapour in the condenser was of extreme tenuity, and that the steam was condensed as instantaneously as it is possible for any means to accomplish it.

Judging then from the foregoing facts and reasoning, the correctness of which is fully confirmed by the practical efficiency of the principle on board other vessels, it does not appear that any solid objections can be taken to the system, however it may be assailed by specious reasoning, founded on unwarrantable assumption and the distortion of facts: a course of procedure at all times to be lamented, and particularly reprehensible in scientific questions, where truth should ever be the guiding star, and personal interest or party considerations never be allowed to intrude.

If power be required to work the condensing water-pumps from which injection condensers are free, the air-pumps in this case are relieved from lifting the injection water, which, together with the reduction of the friction of the slides, the pistons, the air-pump buckets, and their respective rods, through the purity of the water employed, will probably more than compensate the cost; while the little attention required in a heavy sea, compared to condensation by injection, gives great advantage in that particular; and with regard to a litlte increase in the original outlay, that sinks into insignificance in comparison to the value of the protection from decay afforded to the engines and boilers.

Apart from all this, however, a grand object will be accomplished by means of this system, or indeed by any system which ensures a supply of "pure distilled water only" to the boilers; compared to which anything here set down on the increase of power said to emanate from the superior vacuum is as nothing, for by the "*clean*" working of the boilers (and they are indeed beautifully so, maintaining all their original freshness) a revolution both in form and construction of those necessary appendages will be superinduced not heretofore practicable on account of the water's impurity, when high-pressure steam may be generated, as regards personal risk, with as much impunity as the collaps-

ing of a locomotive flue-tube. Hence all the advantages derivable from working steam "expansively" to the "*full extent*" are placed within our reach; which will facilitate the extension of steam navigation to double the distance now performed, without increasing the consumption of fuel, or afford the means of adding probably 50 per cent. of cargo in a transatlantic voyage. In fact, with fifty feet of heating surface per horse power, contained in a boiler of less weight, and occupying not above one-half the present area, together with a slow rate of combustion and a "proper application" of the expansive principle in a suitably adapted engine, the consumption of fuel would not exceed 3 or 3½ pounds of fuel per horse.

I cannot help briefly adverting, before I conclude, to the subject of expansion. We are told that they expand considerably already in marine engines. This we know, and likewise too that it is to very little advantage; for, on examining the top of the *British Queen* it will be found that, by taking the absolute number of strokes performed, the consumption of fuel is actually much nearer seven than six pounds, and therefore double what it ought to be if the principle were properly applied and carried to the "full extent."

The fact is, that a great part of the advantage which might be derived from the expansion of even low-pressure steam is sacrificed by the mode of working, which is by varying the amount and even relinquishing expansion altogether when the maximum power is required; consequently when the greatest quantity of fuel is being consumed no saving whatever is effected. But if expansion is not wholly abandoned, the effect of reduction will be the same to a degree. For instance, take steam of high-pressure, say of 50 pounds above vacuum, and allow it to expand six times, the mean effective force will be 23 pounds per square inch. Now steam of the same pressure cut off at one-third of the stroke will have a mean of 34·9 per inch; but as here is double the quantity of steam expended, we must take twice 23 or 46 pounds as the mean effective force produced by an equal volume of steam when expanded six times. So that by cutting off steam, even at one-third instead of one-sixth of the stroke, in order to increase the power of the engines, occasions a sacrifice of about 25 per cent. of the power; which proves that the mode of varying the power of the engines by modifying the amount of expansion is erroneous in principle.

To obviate this, make the cylinders so capacious that the engines with a given pressure of steam and the utmost amount of expansion, shall exert their maximum power, and any reduction from this that may be desirable when circumstances are favourable can be obtained by checking the rate of combustion, and lowering the pressure, thus, with six expansions, and a pressure of 50 pounds, the steam would flow into the condenser at about eight pounds, and if the power of the engines were reduced one-half by working steam of 25 pounds, this would enter the condenser after expanding to six times its volume at about four pounds above vacuum.

The engines best adapted for working out this principle to the full extent, appear to be those of two cylinders from their equalizing the power more nearly than can otherwise be well done. If six expansions were effected in one cylinder, the power would of course vary from six to one; whereas, by employing two, the difference would amount to only about two-thirds, and with a pair of double cylinder engines in a ship acting on cranks at a right angle to one-tenth less than a half.

I will now close this paper by observing, that the inferred superiority of the *Great Western* engines to the *British Queen's*, from the mere circumstance of the time each vessel occupies in performing the transatlantic voyage does not appear to be warranted for the comparison from the difference of size, of mould, &c., is far too vague to justify such a conclusion. The disparagement heaped upon the *British Queen's* engines however, does not, I am persuaded, arise from any sense of their inferiority, but may be attributed to other causes into which I will not enter.

I remain, Sir, most respectfully,
Your humble servant,
ALPHA.

Limehouse, September 10, 1840.

Postscript.

Sir,—I wish you to add by way of P. S., that long since my paper, which you recently stated was in type, has been in your hands, I have been on board the *British Queen*, and find that there is scarcely an observable undulation of the mercury in the gauges which confirms the theory therein laid down—such being the consequence of a very near approach to a Torricelian vacuum and a rapidity of condensation equal to the velocity of the steam flowing from the cylinder.

With regard to the originality of employing small copper tubes for the purpose of surface condensation, I have to state, that I do not know how long such means might have been in use, but this I do know, that being in Scotland in the year 1828, a gentleman and the writer had some conversation on this important matter, and the best means of effecting an object so desirable in every point, if the thing were practicable at all. The result was, that half inch copper tubes were sent for, but I left for London before they

were applied. On the 2nd of February, 1830, however, I met the gentleman in town, when he informed me "that his experiments on condensing by external cold were tried with an injection engine of 7½ horse power that had been driving machinery for a considerable time at his works; the tubes employed were ½ inch, as before stated, and 1600 feet long; the change he observed materially relieved the engine, saved one-fifth of the fuel, and no more water was used than with the old plan, the water running away from the top of the apparatus at about 120 degrees, a temperature much greater than the water resulting from the condensed steam discharged by the air pump." I have extracted this from a memorandum made at the above date, since which several steam-ships have been built and fitted up with condensers of the same kind at the works alluded to.

ALPHA.

Nov. 25th, 1840.

CONDENSATION.

Sir,—Want of leisure caused me to delay for a short time again addressing you (as I intimated in my letter to you of the 19th September was my intention) on the subject of the essential difference between Mr. Samuel Hall's system of condensation and that of Messrs. Howard and Symington; and my delay has been further increased by Mr. Fox's letter to you on the same subject, which is so excellent and so much to the point, that I admit that many of my observations are anticipated by that gentleman; so much so, that I should not have troubled you with any further remarks had not Messrs. "Tom, Dick, or Harry," and "Scalpel," thrown in your last Number so much dust into the eyes of your readers as to make me think it desirable to brush it away. "Scalpel" admits that he reasons *à priori*, and I have no doubt but "Dick, Tom, or Harry" will admit that they do the same; whereas it is quite clear that Mr. Fox reasons *a posteriori*, which must give him an infinite advantage over his opponents; and I feel quite convinced that his clear and candid narrative will bring more thorough conviction to the minds of all *unprejudiced persons* (to adopt the term you extract from the *United Service Journal*), than I can at all hope to do, especially if those minds be imbued with a masculine knowledge of science in addition to their being *unprejudiced*. I would ask you, is it not surprising that any one, although a mere dabbler in scientific matters, should be so short-sighted as not to see the ease with which 13 gallons per minute of water, at 212°, may be cooled to a low temperature by a small quantity of metallic surfaces in contact with cold water, compared with the performing of that operation upon 1200 gallons per minute, although it be of a temperature of only 100° from which it has to be cooled? Is it not quite clear that the rapidity of the process of abstracting heat from water through metallic surfaces depends upon the difference between the temperature of the water to be cooled and that of the water for cooling the same? If the former, for instance, be 212°, and the latter 52°, the difference between them being 160°, will not the abstraction of the heat be infinitely more rapid than if the temperature of the former were only 100°, and that of the latter 52°, whereby the difference in the temperature between them is only 48° instead of 160°? I contend, therefore, that "Scalpel" is quite wrong in his philosophy when he says "there is nothing why Mr. Symington cannot reduce the temperature of 1200 gallons from only 100° to 60° (i.e., in one minute), as well as Mr. Hall can 12 gallons in the same time reduce 13 gallons from 225° (he should have said 212°) to 60°." He commences his paper by saying neither "R. S. M." nor "Honestometer," ("in whose last, by the way, is a terrible mistake, and who will *not* see what is plain enough to two other writers.") Why does "Scalpel" accuse me of making a "terrible mistake," without pointing out what it is? He next, after approving of the *tone* and *manner* of Mr. Fox's paper, says, "This gentleman (basing his decision upon Mr. Hall's experiments, which, in my opinion, are very inconclusive, and were not conducted with that talent which certainly belong to him) asserts that the doing of that which Mr. Symington and Mr. Howard propose is totally impossible." How "Scalpel" gets his information to enable him to form an opinion that the experiments of Mr. Hall were not conducted with his usual talent, I am not aware, for there is not anything in Mr. Fox's letter to justify his jumping at such a conclusion. "Scalpel" says, "I believe that among *scientific* men the *fallacy* of Mr. Hall's condensation is now pretty well admitted." I am sorry that I cannot return the compliment which "Scalpel" paid to Mr. Fox respecting the *tone* and *manner* of his last as well as his preceding papers in the *Mechanics' Magazine*. The discussion of scientific subjects certainly requires no such gross personalities as those in which "Scalpel" has indulged toward Mr. Hall from the very commencement of his correspondence with you. Now I would, if it were possible, avoid mentioning the name of "Hall" in this discussion, but I cannot in justice to that gentleman do otherwise. May I therefore beg to ask "Scalpel" whence he derives his belief "that among

scientific men the *fallacy* of Mr. Hall's condensation is now pretty well admitted?" Who are these scientific men, let me ask? Are they the intelligent writers in the *United Service Journal*, to one of whom "Scalpel" alludes as having inserted a paper on Steam Navigation in this month's Number of that work? or are these scientific men the engineers who made the engines with Hall's condensers on board Her Majesty's steam-ship *Megara;* the Hon. East India Company's vessels the *Zenobia* and the *Queen of the East;* the *British Queen* transatlantic steam-ship; the Oriental steam Co.'s ship *Wilberforce;* and the India Steam-ship Company's ship *India, cum multis aliis?* These vessels, all of the very first class and size, have been too many years in most perfect operation in the Mediterranean, in India, and the Atlantic, to enable any one, even with "Scalpel's" *powers*, to injure the reputation of Hall's condensers, or to induce a single *scientific* man to believe for one moment that they are *fallacious*. If the above named gentlemen are not the scientifics to which "Scalpel" alludes, perhaps they are "Scalpel" himself and his compeers, "Harry, Tom, or Dick," "A. B. or C.," &c. &c.

I will now notice "Scalpel's" sarcastic appeal to Mr. Fox, in the following words: "Talking of increase of power by the way. How could you, Mr. John Fox, in your celebrated letter to the Admiralty, tell them of an increase of power of one-fourth, besides the saving of fuel by the use of these said 'perfect' condensers." To what extent there is an increase of power and a decrease in the consumption of fuel by the supplying of pure water to the boilers of marine engines, and from the numerous advantages resulting therefrom, I will not pretend to say, but I must observe, that it is somewhat singular, that in your 900 Number, "Dick, Harry, or Tom," claims even more economy of fuel by Mr. Symington's condensers than Mr. Fox does by Mr. Hall's. The following are the words of that three-fold gentleman when speaking of the engines on board of the *Dragon*. "I saw the coals weighed, and counted the revolutions, and carefully took down the results, there was a saving of fuel of *more* than a fourth with S.'s plan." "Harry, Tom, or Dick" seem to speak of the plan of Mr. Symington's system of condensation having been applied to the *Dragon* four years ago, as if it gave him the priority of the invention; whereas, Mr. Fox states, that Mr. Hall applied the self same plan in the year 1832, or eight years ago. Now, if Mr. Hall gave up the thing as practically impossible, and Mr. Symington have brought it to perfection, then let him have the merit ascribed to him of having done so, and if Mr. Hall begrudge him that merit, he is not the man that (from what I hear of him) I take him to be, "Dick, Harry, or Tom" proceeds thus: "About 18 months ago I was on board the *Dragon*, saw Symington's plan tried for two consecutive hours without any mixture of external water," who disputes that such might be done, but my fellow labourer in the vineyard, Mr. Fox, states that the engines "never for one consecutive hour *worked up to their full power*." The last part of the statement is omitted by "Harry, Tom, or Dick," and I am quite convinced, that Mr. Fox is correct, and join him in challenging any person to prove to the contrary, and in so doing, I disclaim making personal or invidious attacks, as my intention is only t advocate the cause of truths of science, which no person, howevever interested or *prejudiced* he may be can overturn. I have a good deal more to say upon this important subject, but I must defer it to another time, and this letter, indeed, you may perhaps consider already too long.

I remain, Sir,

Your most obedient servant,

HONESTOMETER.

N.B. This has been written a week ago, but my being from home prevented my sending it.

November 16.

SYMINGTON'S SYSTEM OF CONDENSATION.

Sir,—A sense of duty to myself obliges me to notice an article in Number 901 of your Magazine, wherein Mr. Howard states that he has "hitherto thought proper to be a silent observer of the many remarks made in your journal on his system of condensation by reinjection, but a sense of duty to myself causes me to write." He then goes on to say, "Allow me boldly to *assert*, that either your correspondent 'Tom, Dick, or Harry' has been most shamefully imposed upon by my plan of condensation, or that he himself is attempting to impose upon others;" and that "he for one should be ashamed to practise, or hope to benefit by the practise, of such deception."

Now, Mr. Editor, there is one thing in my favour; that is, Mr. Howard has merely *asserted* all this, and till such time as that gentleman can prove his assertions to be correct (which will be rather an arduous task for him), he must not feel displeased if but little credence be given to them; for notwithstanding his boast of having "had no little practice on the subject," he has now had four years to examine the specification of my plan of condensation, and as yet seems quite unacquainted with its principle.

It is a pity that while Mr. Howard was so rashly imputing base motives to others, a

sense of duty to himself could not have kept him above suspicion, for most assuredly it is evident from his own showing, that he must have either been deluded, or that he himself has most shamefully attempted to delude others. I have heard Mr. Kingston repeat, on board of her Majesty's steam vessel *Alban*, that if Mr. Howard did all that he said he could do with his plan of vaporisation, it would be one of the greatest improvements hitherto made on the steam engine; for it would save above one-third of the usual quantity of fuel, and that no boilers were needed, besides many other important advantages. In addition to this, Mr. Howard states in your journal for 1836, "that his principle or process answered perfectly on board the *Vesta*." He now tells us, in your Number 901, "his plan of vaporisation has proved defective in some practical points, after many attempts on the great scale more or less successful."

I leave Mr. Howard calmly to reflect whether he has acted fairly towards an individual who has never attempted, in one single instance, to injure him; at the same time to remind him that he has already made one public apology to me for a hasty assertion.

I am, Sir,
Your most obedient servant,
WM. SYMINGTON.

Wangye House, Essex, Nov. 25, 1840.

NOTES OF A READER.

Daily Coaches in 1593.

"At Hamburghe Gate, leading to Lubecke, we found a dogge that followed vs; and some passengers of credit assured mee, that for yeeres this dogge had lien at that gate, and euery day without intermission, watching the first coach that came forth, had followed the same to the village of Attslow, being the bayting place at noone, and after dinner had returned back to Hamburghe Gate, with another coach coming from Lubecke, for coaches passe daily between those cities."

Umbrellas in Italy in 1590.

To avoide the beames of the sunne, in Italy they carry Vmbrels, or things like a little canopy over their heads, but a learned physician told me that the use of them was dangerous, because they gather the heate into a pyramidall point and then cast it down perpendicularly upon the head, except they know how to carry them to avoid the danger."

A Sawing Mill in 1593.

"Between Reichstat and Alstat, near Dantzyke, is a mill which, in my opinion is very rare; it is driven by a river, and without the help of hands saweth boords, and having an iron wheele, which doth not only draw the saw, but hooketh in and urneth the boords to the saw."—*Moryson's Travels*, 1593.

Sedan Chairs.

Sir S. Duncomb, predecessor to Duncomb Lord Faversham and Gentleman Pensioner to King James and Charles 1st, was the person who introduced sedan chairs into this country, A.D. 1634, when he procured a patent which vested in him and his heirs the sole right of carrying persons up and down in them for a certain sum. Sir S. Duncomb was a great traveller, and had seen these chairs at Sedan, where they were first introduced.

Hindoo Corn Mill.

"Two women were seated on the floor, a granite stone between them, twenty inches or two feet in diameter, hollowed out to the depth of several inches; within this was placed a smaller stone of the same description, furnished with a handle and perforated in the centre; through the hole the grain was conveyed, and by the handle the women turned the mill. By this simple process they prepared the flour which was required for their families."—*Massie's Continental India*, vol. 1. p. 129.

Malleable Glass.

"'Pliny, Petronius, Isidorus and others report, that an artificer was presented to Tiberius who had invented a malleable glass, which being cast on the ground, was bent but not broken, and being taken up by the same artificer, was with his hammer brought to the former form and beauty. His reward, besides the wonder and astonishment of the beholders, was that which precious things often procure their owners—for the Emperor asking whether any other knew this mystery, this being denied he caused his head (the only workhouse of this secret) to be smote off, lest gold and silver should give place to art."—*Purchase's Revelations of the World*, London, 1617, p. 901.

Geneva Fire-Escape.

"It is surprising the fire-escape used at Geneva has not been more generally adopted; it may be raised in two minutes to the highest story of a house; a large sack is attached to the upper extremity into which the person in danger is to place himself, its weight in descending raises another to rescue more lives. The Emperor Alexander applied for models of the machine, and it pleased him so much that he sent presents of superb rings to the mayor, the inventor, and the artist who made the drawings."—*Memoirs of the Empress Josephine*, p. 126.

Cutting Timber under Water.

"We passed along several reaches without meeting any impediment, but at length

an accumulation of drift timber and gravel brought us up at a spot where two large trees had fallen across the stream from opposite banks. The sailors swam about like frogs, and swimming divided with a cross-cut saw, trees under water." — *Mitchell's Eastern Australia*, vol. 1, p. 55-6.

Thrashing Machine not modern.

"A gentleman at Dalkeith, in Scotland, has invented a machine for thrashing grain which gives 1,320 strokes in a minute, as many as thirty-three men thrashing briskly." —*Gentleman's Magazine*, February, 1735.

R. W. D.

NEW PUBLICATIONS.

Essay on the Productive Resources of India. By J. F. Royle, M.D., F.R.S., Professor of Materia Medica, King's College, &c., 8vo. pp. 451. London, Allen and Co.

Whatever may be the results to England herself of the career of never-ending conquest and aggrandizement to which she seems by some unhappy fatality to be committed in the East, it is hardly to be denied that so far as the countries which have fallen under her sway are concerned, most, if not all of them, have been great and lasting gainers by the triumphs of her arms. An impression very generally prevails that until recently—no farther back indeed, than the abolition of, the East India Company's monopoly—our merchant-warriors looked to the sword alone, and to the harvests of the sword's reaping, for a good balance in their ledgers. But the archives of the India House furnish honourable evidence that at no time within the last century have the Company been indifferent to the internal improvements of the countries successively subjected to their dominion—to the cultivation within them of those arts of peace by which the ravages of war might best be repaired—while a vast increase of valuable produce exists to attest the success of their beneficent efforts. Of late, indeed, the subject of the "Productive Resources of India," has attracted a much greater share of interest than it has ever heretofore done—of which the well-timed and instructive Essay before us is perhaps as striking a proof as any—but this comes merely of that general ardour which has happily sprung up amongst us of late, to make all the ends of the earth partakers in the benefits of our advanced state of knowledge and science, and to place our greatness as a people on that broadest and most enduring of all foundations, success in the diffusion of the blessings of Peace and Plenty, Civilization and Refinement.

The Essay of Dr. Royle divides itself naturally into two parts, (though not so divided in point of fact); the first showing what has been already done to cultivate the "Productive Resources of India," and the second, what yet remains to be done.

A few extracts from those parts of the book assignable to the former head of its subject, will serve to show that India has been by no means that neglected field which people commonly imagine.

Indigo is a native product of India (as is proved by its name, which is but a corruption of *Indico*, the name by which it was known until recent times in European commerce, and that an abbreviation of *Indicum*, as it is called by ancient authors,) and it forms now one of its staple and most valuable exports. But there was a period in the early history of the East India Company, when the indigo of the East was, in consequence of an inferiority in its mode of manufacture, completely supplanted in all the markets of Europe, by the indigo of the Spanish, French and English possessions in the western hemisphere. It was under these circumstances that

"——about 1779-80 the Court of Directors of the East India Company made extraordinary efforts to increase the production of indigo, and to improve its quality, foreseeing that if they succeeded the result would at once be highly advantageous to India and beneficial to this country. A contract, at prices which were intended to encourage the growth, was therefore entered into with Mr. Prinsep, who at this time considered that India might supply Europe with sugar and cotton as well as indigo; and for a supply of the latter they continued to make other engagements of a similar kind until 1788. But, on reviewing the issue of all the sales prior to the year 1786 it was ascertained that the several parcels yielded a remittance of only 1s. 7d. 67 dec. for the current rupee, which was a loss in the first instance of upwards of seventeen per cent., independent of freight and charges, which may be reckoned at full 10 per cent. more.

"In 1786, several contractors delivered in indigo, which was sold in London; of this, that supplied by Mr. J. P. Scott was the only parcel which yielded a profit, and this to the extent of 11d. 01 dec. per pound. Notwithstanding this, the losses upon the aggregate of the above consignments were very considerable; as that which stood the Company in—

"Cost and charges	£30,207
"Produced only................	21,596

"So that there was a loss of £8,611 or equal to twenty-eight per cent.

"Though these losses had been sustained, important results were the consequence,

Europeans acquainted with West-India methods having proceeded to Bengal, considerable improvements took place in the manufacture of Indigo. Some transmitted by Mr. Boyce, even so early as 1787, was pronounced by a competent judge in London, 'equal to Spanish 9s. 6d. to 10s. 6d. the pound the second sort.' From the proved practicability therefore, of making superior kinds of indigo, and contrasting this with the inferior qualities of that sent from Bengal, as well as the high prices at which it was tendered, the Court came to the determination that the Company should cease to purchase for at least three years. This it was supposed, would have the effect of increasing competition among individuals, and would not 'fail to operate in bringing the article to its greatest possible state of perfection;' at the same time the lowest rate at which it was possible to be manufactured would be ascertained.

"To insure due attention being paid to all parts of the process, and to afford the requisite facilities for attaining success, instructions were sent out concerning the mode of manufacture, as well as directions respecting the square forms in which it was desirable that the indigo should be sent home. Specimens also of the good kinds which it was desirable to rival, were sent to India, and also the reports of the dyers and brokers on the several samples which had been successively transmitted from India. Besides this, some of the duties were remitted for the seasons of 1789 and 1790, and relief also afforded both as to tonnage and freight. Advances were likewise made by the Government to some manufacturers, and 'as a further aid,' the Company made large advances of money secured on the indigo, on a plan of remittance to London, and this course was followed for many years.*

"It is extremely interesting and instructive to find these measures followed by rapid improvement in the quality of the indigo. It is stated in a letter of the Court of Directors of the 30th of May, 1792, 'It affords us much pleasure to remark that the article, as to quality, is still increasing in reputation. It has already surpassed the American and French, and there is no doubt but by perseverance and attention on the part of the planters, it will effectually rival the Spanish.' In fact a parcel of five chests, belonging to Messrs. Gilchrist and Charters, was declared to be superior to Spanish, and was sold at a higher rate; while the buyers deemed it to be possessed of every requisite that could be wished. By the accounts of the quantities of indigo imported into great Britain during ten years, ending in 1791, it appeared, that in proportion as the imports from Bengal increased, there was a diminution from other parts.

"From the success of the culture it was prosecuted with undue vigour, as this, in the year 1795, caused an importation of 4,368,027lbs., of which the consignments from Bengal alone amounted to 2,956,862lbs. From this immense quantity being thrown into the market, and from four-fifths of it being of a very inferior quality, a considerable reduction in price ensued. The fluctuations continued to characterize the commerce of indigo, and this not only for the above reasons, but also because the consumption of indigo depends upon the condition and progress of other manufactures. The reduction in price was at no time more remarkable than between 1824-25 and 1829-30, having been 11*s.* 5¾*d.* a pound in the former, and 4*s.* 3¾*d.* in the latter. But the trade increased gradually to a great extent, as no less than 9,913,010lbs. were imported in 1828, though not more than 6,545,873lbs. in the year 1837; of these importations *ninety-four per cent. was supplied by India.*

"Few histories of commercial products are more instructive than that of indigo, which we see an article of export in the earliest times, from the country where the plant is indigenous. It formed one of the principal articles imported by the East India Company in the first century of their commerce, but was soon supplanted when European skill was applied to the culture of the plant; and the manufacture of indigo in the West Indies and southern parts of North America. It was restored again to the country of its birth by the very means by which it had been wrested thence, that is by the application of European skill and energy, as well to the culture of the plant as to the chemistry of the manufacture. Accurate information was also supplied, and specimens of the quality of drug it was desirable to rival.

"But all these would hardly have sufficed had it not been for the extensive purchases made by the East India Company, the losses which they sustained, and the advances which they still continued to make. The manufacturers eventually attained a degree of skill, which in a climate favourable to the plant, and backed by cheapness of labour in Bengal, enabled them to bid defiance even to the more practised manufacturers of the West. The culture and manufacture being established, indigo has continued one of the staple products of Bengal. Its goodness is permanently secured by the planters in Bengal and the south-east provinces attending to the culture of the plant and the manufacture of the indigo, while those in the north-western parts of India supply them with seed. The

* "Vide 'Report of the Proceedings of the East India Company in regard to the Culture and Manufacture of Indigo.' p. v."

moisture and richness of the Bengal soil and climate are favourable to the luxuriant growth of the parts of vegetation, in which the colouring matter is secreted, while the comparative dryness of the northern provinces enables them more easily to perfect the parts of fructification."

Not very dissimilar is the history of "Silk Culture in India."

"In India the silk culture flourished only in the southern parts, that is in Bengal; and all the East India Company's filatures were confined to that province, and did not extend beyond 26° N. lat. Silk has long formed an article of commerce from India, but in inconsiderable quantities before the middle of the eighteenth century. It was, moreover, very inferior in quality, 'being wound from the cocoons, and reeled into skeins after the rude manner immemorially practised by the natives of India' and which is now distinguished by the name of '*country wound*.' It fell into so much disrepute that the Court of Directors informed the Bengal Government, that unless the defects could be rectified, the Company must abandon the exportation of it to England.*

"The Court were induced, in the year 1757, to send Mr. Wilder, 'a gentleman who had the reputation of being perfectly acquainted with the culture and preparation of silk in every stage,' out to Bengal. He remained in India till the time of his death, in 1761, and laid the foundation of great improvements in the winding of the silk. 'Subsequently to the acquisition of the Dewanee, the cultivation of the mulberry was recommended in the strongest manner to the Zemindars and landholders, and all possible encouragement afforded for the clearing of such lands as would best answer for the purpose.' 'The Government also was directed to make such deductions from the rents of the lands planted with it, as should have the effect of a bounty in its favour, and render it more profitable than any other kind of culture.' By these means a very great increase took place in the importations of silk from India.

"But hitherto the better modes of preparing the silk had been but partially successful, and as 'considerable dealers and manufacturers had given it as their opinion that the staple of the Bengal raw silk was equal to that of the Italian or Spanish, and capable of being used for all purposes—if reeled in the same manner,'—it was determined in 1769, 'to introduce into Bengal the exact mode of winding practised in the filatures of Italy, and other parts of the Continent.' For this purpose several Englishmen and foreigners, as Messrs. Wiss, Robinson, and Aubert—and others as drawers, winders, reelers, and mechanics—were retained for the purpose of proceeding to India. It was also determined that the method of spinning and drawing the silk as practised at Novi,* in Italy, was to be adopted throughout all the filatures. The first silks prepared by the Italian method were sent to the Court of Directors in 1771, and reached England, 1772. The report which was made here on their arrival was, that 'Mr. Wiss had succeeded to admiration in drawing a tolerable silk from the most ungrateful cocoons that the sickliest worms under the most unfavourable proceedings could produce; that the coarse silks could not be much improved; that it was the finer sizes that required reformation, which, if accomplished, the Company would view the advanced price and eager demand for it with astonishment.'

"About this period the Bengal government applied for, and received from China a quantity of the China silk worms, as well as mulberry plants, which were planted in the Governor General's garden. It is unnecessary to follow the history more minutely, as it has been shown that the introduction of the Italian method of winding silk in Bengal may be dated from about the year 1770, but it was not until 1775 that the new mode could be considered as in full operation. In the intermediate period much time was unavoidably taken up in erecting buildings, fitting up furnaces, reels, &c., and in instructing the natives, whose long established prejudices it was difficult to remove, so scrupulously averse are they to innovations of any kind.'

"The result of the successful efforts for improving Bengal silk was quickly seen by the decline of importations from Aleppo, Valencia, Naples, Calabria, and other places in the Mediterranean, so that in a very short period the whole of the silks used in this country were furnished only from the northern provinces of Italy, from Bengal, and China.

"In the deficiency of the supply of hemp from Russia, and in that of sugar from the West Indies, we have seen that India was looked to, to relieve the wants of the British public. So in 1808, when the decrees of Napoleon occasioned an entire cessation of the customary importations of Italian raw silk into this country, the silk trade held a meeting at Weaver's Hall. It was then resolved unanimously, 'That Bengal silk has become highly necessary in many branches of manufacture, and that from experiments lately made, it is found fit for purposes to

* Report of the Proceedings of the East India Company in regard to the Trade, Culture and Manufacture of Raw Silk. London, 1836.

* Various tools, implements, and models, manufactured in London and at Novi were forwarded to Bengal for the use of the establishments.

which it had not before been thought suitable." "That it was highly desirable that its quality should be further improved, and that a greatly increased quantity should be brought over." A committee was also appointed to confer on the subject with the Chairman and Deputy Chairman of the East India Company.

"In consequence of this, orders were sent to the Bengal government to adopt all possible means for increasing the supply of silk, and to arrange, as soon as circumstances would admit, that the whole of it should consist of the filature wound class. Instructions for reeling silk were furnished by Mr. Wiss,* and these were sent out to Bengal, and directed to be supplied to the residents at the several silk aurrungs, and to be translated into the native languages for the information and direction of the native servants who are entrusted with the care of the minor establishments. The Indian Government was also recommended to consider whether it might not be practicable to a certain extent to establish mulberry plantations on its own account.

"To remove uncertainty respecting the exact sizes of filature silks required, the Court transmitted to Bengal sets of regulating specimens, with directions that the silk should in future be manufactured strictly in conformity with them. Specimens of the cocoons reared in the vicinity of the several factories were also required, with reports on the varieties of the Bengal silk worms by the different commercial residents. The commercial resident at Santipore having suggested that a certain quantity of mulberry-land should be cultivated and that the silk worms should be reared and the cocoons formed under his immediate superintendence, his recommendation was sanctioned both by the Indian and Home Government. The experiment was continued until 1830, but the silk was not found improved in proportion to the expense incurred.

"From the foregoing cursory view of the means adopted for improving the silk culture of India, we observe that there, as in Europe, improvements have generally, if not always, been urged upon cultivators by the influence and expenditure of the government. In later periods of the history of nations, individuals are sufficiently well informed to adopt suggestions for a prospective advantage; though this is never found to be the case, nor indeed can it be expected in nations less advanced in civilization.

"The result of the measures which had been adopted were, as we have seen, firstly, great improvements in the silk of Bengal, and secondly, the quantity imported into England was increased, *from* 401,445*lbs.* *in* 1792 *to* 1,387,754*lbs.* *in* 1829, though in subsequent years it was somewhat less.

"The culture of silk though susceptible of further improvement, having succeeded to so great a degree in Bengal, ought to afford the best encouragement for the ultimate success of other cultures. Many of these are not more hopeless than that of silk appeared when the East India Company determined upon attempting its improvement. In fact, any difficulties must be fewer in number and less in degree. For in that we had not only to procure the animal which was to prepare the silk, but also the leaf upon which it was to feed; and thirdly, a climate was required, suitable both for the growth of the vegetable and for the healthy existence of the animal."

A still more striking instance perhaps than either of those we have quoted of the beneficial influence of the Company's Government on the internal character of the country, is to be found in the following extract from a charming account of the celebrated Botanic Garden of Calcutta:—

"The result now is that a complete change has been effected among the inhabitants of Bengal with respect to their gardening. Country seats have risen in all directions, gardens have been attached to the houses in town, in the suburbs and on the banks of the river, both among natives and Europeans, all replete with the choicest fruits and flowers. Similar improvements have taken place in many parts of the interior of the country. The share which belongs to the garden in producing this amelioration is evident, from this fact, that scarcely a garden exists in Bengal, certainly not within 20 or 30 miles from Calcutta, that has not received supplies of plants from it; besides large collections being transmitted to all parts of Hindostan. Such is the difference of feeling in this respect among the natives of the country, that it is gratifying to find that for one man who used to ask in former times for plants there are now ten applicants; and these chiefly among the middling classes both of Hindoos and Mahomedans.

"Among the useful trees which have been distributed, many hundred thousand timber trees, some indigenous in the country, and others introduced from congenial climates, besides their seeds, may be enumerated. Amongst them the teak, mahogany, logwood, and casuarina, hold a conspicuous place, and numbers of these may now be seen grow-

* Mr. Wiss having returned to England was presented by the Court of Directors with 1,000*l.* for the assiduity and skill with which he had established the Italian mode of winding at one operation from the pod. He was also appointed silk superintendant, and "continued in the Company's home service for many years, and was eminently useful in furnishing the Resident in India with suggestions for improving their silks." Report, page xvii.

ing in great luxuriance in the northern provinces, at least as far as 1000 miles from Calcutta. The teak is of slow growth, requiring from 60 to 80 years to attain the proper size and maturity for ship building; but Dr. Wallich states that the large trees in the Calcutta garden are equal in size to the generality of those of probably similar age which he saw in the forests of Martaban, and little inferior to them in the quality of their wood. The mahogany grows as well in Bengal as in its native country, and though inferior in fineness of grain to the best kinds, it is at least equal in quality to that of Jamaica. Of the native woods there are a great variety, and of every quality, which it is unnecessary here even to mention further. To bring as many as possible of these into general cultivation has been, and must always be, one of the primary objects of the institution.

"The garden has likewise been extensively beneficial to the country in the distribution of fruit trees; a fact best proved by comparing the quantities that are annually sent from thence, with the manifest improvement that has taken place in the fruit markets and gardens. Not only have the indigenous plants been improved, but foreign fruits of various kinds have been introduced, as the sapota, Otaheite apple, alligator pear, litchee, loquat, wampee, mabolo. Besides, the guava, custard apple, soursop, pumplemoose, pine apple, and others introduced at earlier periods with its own indigenous fruits such as the mangoe, plantain, and orange. But it is not to be expected, as some seem inclined to think, that with these, the apple, pear, gooseberry, and currant, will be found growing, as if Calcutta was a temperate climate. Many of the above fruit-trees, such as all the Chinese and West India fruits, were originally introduced into India by the Calcutta Botanic Garden and all the others have been greatly improved.

"The Lansa, a Malayan fruit of very delicate flavour has lately been multiplied for distribution, and even the Mangosteen and Bread fruit trees have so far become accustomed to the climate as to endure the hot weather, and fogs of the cold season without injury. The Nutmeg, which, during many years has existed in the Calcutta garden, and even produced ripe fruit, has by a slight modification of the treatment, become less impatient of the climate. The Cherimolia, a fruit of new Spain, which is described by Humbolt as being of very excellent quality, thrives well in Bengal; but though it flowers annually, it has not yet ripened its fruit.

"As a magnificent garden, laid out in a beautiful manner and stored with the choicest vegetable productions, the Calcutta garden, has during many years been visited by all classes of people for the sake of harmless, rational and useful recreation. Persons of all nations and ranks, both European and natives, resort to it, and are freely admitted, having liberty to walk over all the grounds, and examine every plant and species of cultivation. The garden is accordingly much frequented at all seasons of the year, but more particularly in the hot and cold seasons, during which, on Sundays and holidays, when public offices are shut, and no business is transacted, it is frequently crowded by individuals and families who come down to enjoy a day of coolness, pure air, and relaxation."

The general object of Dr. Royle's Treatise is to show that by like paternal and judicious means to those which have imparted so much prosperity to the Indigo and Silk manufactures of India, there is scarcely any other product depending on soil and climate which may not be cultivated to nearly as good purpose—extending, as the British Dominions do, through no less than twenty-four degrees of latitude (8° to 31° N.) and embracing almost every conceivable variety of elevation and temperature, and in the accomplishment of this object we think he has been eminently successful. The author confines himself strictly to what may be called the *physical* view of the subject—to those means of improvement which come within the proper sphere of the botanist and agriculturist; leaving untouched, or adverting only incidentally and generally, to those obstacles to the cultivation of the internal resources of India arising from political causes, by which, nevertheless, all the world knows, our fellow subjects of India have been, and still continue to be, great sufferers. The other cultures of which Dr. Royle chiefly treats are, pepper—cochineal—cotton—sugar—flax and hemp—wool—coffee—tobacco, and tea; and on all these heads, as on the others, he has brought together a great deal of very useful and curious information, interspersed with much judicious suggestion and profound philosophical reflection.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

DAVID GOOCH, OF PADDINGTON, ENGINEER, *for certain improvements in wheels and locomotive engines to be used on railways.*—Rolls' Chapel Office, Nov. 20, 1840.

Those improvements consist simply in forming the outer or working surface of the tire of engine and carriage wheels of steel, which may be made of any required degree of hardness. The application of steeled tires to wheels used on railways (it is said) has hi-

therto been prevented by the difficulty of forging and fixing them. The following method of surmounting this difficulty is Mr. Gooch's:—

A faggot of wrought iron bars are worked and hammered, or rolled into a solid piece, and afterwards drawn out in rolling, or under the hammer upon an anvil, having a groove to form the flanch, into the state of rim iron. An indentation or hollow is then made lengthwise of the bar near the flanch, in order to prepare it for the reception of the steel. A faggot of steel bars is then so arranged, that when hammered and worked into its droper (wedge) form the edges of the bars shall form the broad surface of the tire. The two bars of iron and steel thus prepared are then welded together, and afterwards formed into a rim or hoop of the form required. The wheel being prepared in the usual way, and its rim turned, it is laid flat on a true face-plate, and the tire being regularly and uniformly heated red hot, is put round it. The whole is then plunged into cold water or other frigorific mixture, which contracts the tire and hardens the steel. Holes having been previously drilled through the steel hoop, are now continued through the rim of the wheel, and both are rivetted together. Or, the rivets may be advantageously dispensed with when the steel is driven well into the indentation prepared for its reception. "Many important advantages," says this patentee, "will arise from the use of steeled tires on railways; besides the economy immediately resulting from the greater durability, a vast reduction will be effected in the wear and tear of the engines, the carriages and the rails; while a corresponding improvement will arise in the comfort and safety of travellers. The intense friction to which the wheel is subjected, occasions a rapid wear and tear of the iron tire, productive of most injurious consequences. An indentation is soon formed by the rails on the tire, which disturbs the action of the wheel, and destroys smoothness of motion. The same causes derange the action of the engine itself; every revolution of the locomotive wheel brings an irregular strain on all the parts, which materially increases the wear and tear to which they are liable. Great damage is also done to the railway, on which the wheels at every revolution act like so many ponderous hammers. It has been found advantageous to make the working surface of the wheels conical, diminishing from the flanch; but the conical surface of the iron tire is soon worn down, and the wheel made conical the reverse way, causing a serious loss of tractive power and increase of friction on all the parts affected. By the use of steeled tires these evils are henceforth to be avoided, the extreme hardness of the surface enabling them to endure without injury the action of the rails for a considerable length of time."

The claim is, 1. The mode described of forming and hardening steeled tires of wheels to be used on railways. 2. The use of steel in the tires of engine and carriage wheels for railways.

We wonder what the several inventors, patentees, and advocates of *wooden tires* will say to all this?

William Henry Smith, late of the York-road, Lambeth, but now of 20, Rockingham-row West, New Kent-road, Engineer, *for an improvement or improvements in the mode of resisting shocks to railway carriages and trains, and also in the mode of connecting and disconnecting railway carriages; also in the application of springs to carriages.*—Rolls' Chapel Office, Nov. 28, 1840.

The first improvement consists in applying to railway carriages certain combinations of machinery or apparatus, affording an increased length of elastic resisting power, with a consolidated action of the same, calculated to obviate the present liability to danger. The second, a peculiar mode of connecting the engines or carriages, whereby they may be more readily attached to each other, or instantly detatched, thus placing them more completely under the control of the engine-man or conductor, by whom the connection may be broken (without his leaving the foot-plate) in case of the engine getting off the rails or meeting with any other accident; or a solid connection may thus be formed between the carriages, causing a simultaneous action of the whole train upon one point of resistance, thereby lessening the amount of spring or other elastic resistance required, and at the same time ensuring greater safety and efficiency of action. The third, consists in a certain application of the vertical or side springs, by which is obtained in a greater degree an universal action of the carriage, presenting an increased elastic resistance in the direction of the shock, whether lateral or vertical. In the first case, a series of helical or other springs are placed in parallel rows, side by side, beneath one of the carriages; a single buffer-bar extends, by connection, through the whole length of the train, and projects about five feet beyond the carriages at each extremity. This buffer-bar is connected to two cross arms, which abut against the two ends of the series of springs already mentioned. A buffer at the end of the bar receiving any shock, it is transmitted along the bar to the cross pieces impinging on the springs, which present an elastic resistance to such pressure. As these springs can be acted upon from either end, should a collision occur from one train overtaking another, both would, if thus equipped,

be found unhurt; the consolidated resistance in each being brought simultaneously into action. Another mode of resisting sudden shocks is by means of a male screw upon the buffer-bar running along the under side of the carriage frame, having a quick thread "so as to fall by its own gravity," and turn freely in a nut or collar firmly affixed to the carriage. Any shock, it is said, would be transmitted through this collar in a much less degree (proportioned to the angle of its thread). The end of the screw is attached to a strong verge spring, which increases the resistance to the turning of the screw as it is wound up, so as completely to overcome the shock. The screw is acted upon by a buffing bar. "The main value of this part of my invention," observes the patentee, "is, that the springi s affected but in a small degree by the amount of shock endured, its principal portion being received in the collar, and the resistance not increasing in the same proportion against the spring as in the ordinary methods; but by the screw's application, I calculate, five-sixths of the effect of the concussion would be received by the collar (*ergo: by the* CARRIAGE), and the same proportions to any extent." A third method of resisting shocks is by means of an hydraulic apparatus, consisting of a large close cylinder filled with water, placed under the carriage; a piston works loosely in this cylinder, the piston rod passing through a stuffing box, and forming the buffing bar; a passage under the cylinder, which connects its two ends, is closed by a cock. On encountering a shock, the buffer-bar forces the piston along in the cylinder, the water rushing from before it through the open cock, the contracted orifice of which impedes its progress and checks the motion of the piston. As the piston rod is pushed in, a connecting rod passing from it to the cock closes the latter, when the water can only escape by the sides of the piston, thus offering a still greater amount of resistance. The piston is capable of working either way, according to the end of the train from which the shock is received; and owing to the piston not fitting tightly, there will be no liability of it or the cylinder receiving any injury. There is a reacting spring for restoring the piston to its original position.

The mode of connecting and disconnecting railway carriages is by the following arrangement:—A connecting bar is attached to the engine by a pin joint, and kept in the right position by a staple pendant from the foot plate; at the other end of this bar there is a piece projecting upwards. A bell-mouthed aperture is let into the front frame of the tender or carriage, which guides the before-mentioned bar into the recess in case of any variation of the relative positions of the carriages. On pushing the carriage, &c. up to the engine, the bar enters the aperture, pressing down a strong spring until the projecting piece of the bar enters a slot or cavity prepared to receive it, when the spring rises and forms a permanent connection. In order to disconnect the engine, it is only necessary to press with the foot upon a small rod, which, acting on the projection, forces down the spring, and allows the bar to be withdrawn.

The new mode of applying springs to carriages of every description, consists in adapting four sets of helical springs, to work obliquely between the wheel axles and carriage frame, being inclined at an angle of about 40° from each other towards the ends of the carriage. The object of this arrangement is (said to be) to receive the jerk in whatever way it may come, either from the wheels or the buffers, and transfer it to the opposite spring, which together (the one by compression, the other by expansion) present an additional resistance to the action of the shock. These springs have also a double vertical action resisting shocks either from above or below.

GEORGE HENRY BURSILL OF RIVER-LANE, LOWER-ROAD, ISLINGTON, GENTLEMAN, *for an improved method or methods of weighing and certain improvements in weighing machines.*—Enrolment Office, Nov. 28, 1840.

The improvements under his patent apply to all methods, as well as to all instruments, for ascertaining the weight or pressure of solid, fluid, or aeriform substances.

The first of these consists of a cylindrical vessel which fits into a socket upon a stand; within this is another vessel, communicating by a horizontal leg with a third vessel of like form but smaller dimensions. Mercury is poured into these till it stands at the same level in both. They may be made of any suitable material, but well-baked pipe-clay is found to answer best, mercury having less tendency to adhere to that than to any other substance. A piston, or plunger, having a scale pan on its upper part, rises and falls freely in the larger mercurial holder. An open topped glass-tube, which may be closed by a cock or stopper, is fitted air-tight into the smaller mercurial holder; into this tube some coloured fluid of less specific gravity than mercury (as oil, water, spirit, or dilute acid) is poured, until it fills the space above the mercury and rises a little way up the glass-tube. A moveable index-plate, properly graduated, is placed in contact with the glass-tube, the zero point of this scale being brought to an exact level with the top of the coloured fluid. On placing a weight on the scale-pan, the piston will be pressed down, which, displacing a quantity of the

mercury proportional to its bulk, will cause that in the other vessel to rise, and the displaced water or other fluid of less specific gravity resting upon it, to ascend in the tube, indicating by the graduated scale the weight of the displacing body. The rise of the coloured fluid in the glass tube will be greater than the excess of the vertical rise of the mercury in the larger beyond that in the smaller holder, exactly in the proportion in which the coloured fluid is of less specific gravity than the mercury. When water is employed with mercury, there is a range of about one foot in the glass tube for every inch in the mercury holder. In order to preserve the perpendicularity of the piston, it is connected with a parallel motion, consisting of two arms, working on separate centres. A counterpoise of equal weight with the scale-pan and piston, is attached to one of the parallel rods. Instead of one column of a fluid lighter than mercury, two tubes of the united length of the one, each having a separate holder, may be connected with the principal mercurial holder, but at different levels, and by this means an equally long indication may be obtained at a height more convenient to the eye. Another form of machine is shown and described by which heavy as well as very light weights may be ascertained with equal facility and exactness with a very small quantity of mercury; an inclined curved tube, or mercurial holder, closed at the bottom, communicates near its lower extremity with a vertical glass tube, containing some coloured fluid of a less specific gravity than mercury. A steelyard beam is supported by knife-edge centres at one extremity; from the other, a scale-pan is suspended; at a similar distance within the fulcrum, a second pan is also suspended, the glass tube being just midway between the two; between the glass tube and the extreme scale-pan, a curved piston corresponding in form with the mercurial holder is secured by a screw. The scale-pan at the extreme end of the steelyard is for light weights; that nearer to the fulcrum for heavy ones—and the distance between them may be so regulated as to indicate any definite proportional difference—as, for instance, that one shall indicate pounds and ounces, the other ounces and drachms, while one scale or indicator will serve for both.

Another form of machine on the same principle, is constructed with the scale-pan hanging centrically between two vertical tubes and two index-plates, placed apart, so that the weights indicated by the machine may be seen at the same instant by two different parties. In another arrangement, the operations are indicated by the fall instead of the rise of the coloured fluid in the indicator tube. The top of the piston carries a beam resting on knife edges, to one end of which a weight is attached, and near it the piston; from two appropriate distances on the opposite end of the beam, scale pans are suspended, a weight placed in either of which, raises the piston more or less out of the mercury, and proportionally depresses the coloured fluid in the indicator tube. Two self-acting contrivances are described, either of which may be added to any of the foregoing machines, for the purpose of compensating for changes of temperature whenever it is considered needful; these contrivances are applicable to other machines on the common construction, barometers especially.

Richard Freen Martin, of Derby, Gentleman, *for certain improvements in the manufacture of certain descriptions of cement.*—Enrolment Office, Dec. 2, 1840,

The improvements which form the subject of this patent, relate more particularly to those descriptions of cement for which a former patent was obtained, dated Oct, 8, 1834, but are also applicable to other cements, as set forth hereafter. In the former patent, in order to produce certain hard cements, it was directed that gypsum either in its natural state, or as plaster of Paris, or limestone, or chalk, or lime, in the state of powder, should be mixed with a solution of any strong alkali neutralized by an acid, (American pearlash and sulphuric acid being preferred) and that water should be added to the mixture till it was in a fit state for casting or moulding into cakes, and to be subsequently dried and burned, The patentee has since discovered that the said processes may be facilitated and the cost of them reduced in the following manner:—

First, instead of employing alkaline and acid solutions, the acids and alkalis are to be used in the solid state, either added separately or previously combined together, and no more water employed than the materials themselves contain.

Secondly, in certain cases the addition of the alkali, or both the acid and the alkali are dispensed with, and the quantities of these ingredients incorporated in the substances themselves are depended upon, to form the bases of the cements. In carrying out the first improvement, a quantity of pearl-ash is dissolved in water, to which is added a sufficient quantity of sulphuric acid to form a neutral compound; this mixture being evaporated to dryness, leaves the required compound in a solid state.

When it is desired to add the acid and alkali separately in a solid state to the gypsum, chalk, &c., pearl-ash is used and dissolved, or where cements of superior density are required some of the alkaline earths (barytes for instance) are employed. The acid constituent is obtained by using sulphur

or sulphuric acid in combination with other matters, as pyrites and mineral sulphates, or some solid substance containing both an acid and an alkali, as alum, &c.

In this case it is necessary so to regulate the acid and alkaline proportions, as that they shall always exactly neutralize each other. The acid and alkaline matter being provided in any of these ways, is to be mixed with gypsum, or lime-stone, or chalk, in the following proportion:—to any given quantity of either of the foregoing or similar substances, add as much solid alkali and acid as that for every part by weight of alkali (of the strength of the best American pearl-ash) there shall be about 150 parts of the gypsum, &c., or of the gypsum and lime combined in equal proportions. These materials are then to be ground together into a fine and well-mixed powder, which is to be first dried and afterwards calcined in suitable revolving cylinders. By the second improvement, cement may be formed by combining gypsum and lime with a third substance containing or producing an acid; or by combining gypsum and lime alone, without the addition of any third substance either of an acid or alkaline quality. 1. About two parts by weight of gypsum are to be mixed with one part of lime, and for every 100 parts of lime or thereabouts, there is to be added one part of sulphur, or of some substance from which acid is produced, regulating its quantity according to its superior or inferior acid producing qualities. 2. To make a cement from gypsum and lime alone, these are to be mixed in such proportions as that the moisture given off in the process of calcining them together by the gypsum shall be just sufficient to slake the lime.

When the London grey-stone lime is used, about two parts of gypsum are required to one part of lime. In all cases the materials are to be ground and calcined as before stated. The modes of using the cements thus formed is the same as set forth in the specification of the former patent. It is found to be advantageous to use none of such cements in a fresh state.

RECENT AMERICAN PATENTS.

[Selections from Dr. Jones's List in the Journal of the Franklin Institute, for Aug. and Sep., 1840.]

Supplying Locomotives with Water. *S. Vail; July* 12, 1839.—The following extract from the specification, in which the references to the drawings are, of course, omitted, will furnish a clear idea of the nature of the invention:—

" My invention is intended to dispense with the reservoir now used at those stations where locomotive engines are to take in their supply of water, into which the water has usually, to be pumped by hand, at great labour; and in which, in cold weather, its temperature is frequently reduced considerably below that of ordinary well water. This object I accomplish by applying the power of the locomotive engine to work a pump or pumps, raising water from a common well, and supplying the tank therewith, by merely driving the locomotive on to the lateral track, where it is to receive its supply of water, and allowing its driving wheels to rest on two friction wheels affixed to a line shaft situated in a pit prepared for that purpose below the track, the peripheries of said friction wheels extending up to the line of the rails, and passing through openings therein, prepared for that purpose. I move the locomotive by means of chains, or other suitable contrivances, so that it shall stand steadily with the peripheries of its driving wheels resting on the above-named friction wheels, which, when the steam engine is started, will necessarily drive the friction wheels, the shaft of which has attached to it the apparatus requisite for working the pump or pumps.

" Having thus fully described the nature and object of my invention, and shown the manner in which the same may be carried into operation, what I claim therein, and desire to secure by letters patent, is the within described mode of working pumps for raising water from wells for the supply of locomotive engines, and which mode of communicating power may also be applied to other useful purposes: that is to say, I claim the placing of friction wheels upon a shaft, below the track of a railroad, in such manner as that the driving wheels of a locomotive engine may be made to rest upon their peripheries, and when set in action by the steam engine, will give motion to said friction wheels, and, consequently, to the machinery attached thereto, substantially in the manner and for the purpose set forth."

Vents for Barrels, &c. *S. Pike; July* 12, 1839.—This vent is intended to be self-acting, the valve which closes it being opened by the pressure of the atmosphere. It may be said to be in the form of a syphon, with very short legs. The longer leg is furnished with a screw, which screws into the upper side of the barrel; the short leg has a valve within it, which, falling by its own gravity, closes the opening into it. When this is in place, and liquor is drawn from the cask, the pressure of the external air will raise the valve, and air will pass in.

The claim is to "a vent for tight vessels, furnished with a valve, which opens by the pressure of the air when the liquor is drawn, and shuts by its own weight when the drawing ceases, constructed in the manner and for the purposes described."

DRESSING MILL STONES; *S. Trumbull, August* 2, 1839.—The machine which is the subject of this patent is said to be applicable to the dressing, or pecking, of millstones, and also to stones of other descriptions.

A round peck-staff is prepared so as to have a steel chisel affixed in one end, and this staff is made to work up and down by hand in a stock, or slide, through which passes a guide rod, along which the stock may be moved back and forth, horizontally. By means of another guide rod, the stock, with its peck staff, may be made to stand either vertically or obliquely. The whole apparatus is to be fixed on a platform, upon which the operator is to stand when using the instrument; and when this is so placed that the chisel will stand directly over, and the guide rod in the line of a furrow, the peck staff is to be worked up and down by hand. The claim is to "the combination of the ways, or rods, the stock, fork, and peck staff, or handle, as described."

The fact is, that there is but very little novelty in this machine; mill-stones have been dressed by similar machines, in which the chisel was directed along the furrows by guide rods, although under an arrangement different from that above claimed.

MACHINE FOR PACKING FLOUR; *J. Banta, August* 2, 1839.—There is, we think, much novelty in the piston of this flour packing machine. The piston consists of a hoop of the proper size to enter a flour barrel, and the circular disk within this hoop consists of six, or any other convenient number of valves, or shutters, which fill up the space between the hoop and the centre, they are hinged by one edge to the hoop, and to the piston rod in the centre, opening downwards, and when closed constitute a flat piston. The piston rod receives a rotary motion, and is also worked up and down by means of a crank, during the time of packing. When this operation is to be commenced, the piston is allowed to descend to the bottom of the barrel which is to be packed; a quantity of flour is then put in above the piston, the rising of this allows the valves to open and the flour to fall through, whilst by its descent and revolving motion, the flour is packed; the operation being continued until the barrel is filled. The piston rod and its appendages are contained within a frame that slides vertically within an exterior frame, or guide posts, and this interior frame is allowed to descend at every stroke of the piston.

The claim is to "the mode herein described of packing flour by means of the piston head with valves, and having a vertical reciprocating and horizontal rotary motion, all as herein described." We see no reason why this plan should not succeed well, provided there is not a tendency in the valves to clog, and with a dry article, like flour, this, probably, will not be the case.

MAKING CLOTH IMPERVIOUS TO WATER, AND ADDING A NAP THERETO. *W. K. Phipps; August* 31, 1839.—"I take a piece of linen, woollen, or other cloth, and laying it on a table, or other smooth and even surface; I apply to it with a brush, or other suitable instrument, a thin coating of liquid cement, or composition, in an even and uniform manner over its whole surface. The cement I use for this purpose, and the one I consider to be the best, is linseed oil mixed by boiling with some kind of drier, as gum shellac, red lead, and litharge, one pound of each to a gallon of the oil; or the oil may be used as a cement without any drier, in which case the cloth will be longer drying. I usually colour the cement of the same colour the nap is intended to be.

"Having thus applied the cement, I take the material of the nap, viz. flock, or the shearings of woollen cloth, the same that is cut off by the cloth dressers in shearing the same, or other description of material, for nap, and scatter it evenly, by sifting or otherwise, over the surface of the cloth, and then let the cement dry. The cloth, when dried, may be dressed in the manner of other cloths, having a nap of similar description.

"I call it talipot cloth. It forms an excellent and cheap material for the covering and lining of carriages, for storm coats, and for various other purposes."

WINDOW BLINDS. *A. S. Grenville; Aug.* 9, 1839.—The claim under this patent is to "the method of opening and closing blinds by means of the combination of pulleys, cords, and sliding blinds, in the manner described."

These blinds are called railway blinds, as they are to run on wheels, or pulleys, in the manner of sliding sashes. There are to be pulleys in the window frames, around which cords pass from the interior of the room, and which are attached to the blinds on the outside of the window. By this arrangement the blinds can be opened and closed without opening the window.

SPARK ARRESTER. *H. Wilton; August* 17, 1839.—The general principle upon which this spark arrester is constructed is the same with several which have preceded it, but with some variations and additions in the combination. The smoke flue is to be surrounded by a casing, leaving a space between the two for the reception of sparks. The cap is to be covered with wire gauze in the usual manner, and in front of it there is to be a funnel-formed opening, to collect the wind which is to drive the sparks back into a conductor leading down to the space between the flue and its case. At the lower part of the chim-

ney there is to be another funnel-formed opening leading into the flue, and, of course, crossing the space between it and the case; this is said to be for increasing the draught of the chimney, which we apprehend it will fail to effect.

The claim is to "the combination of the funnels, prism, and conductor with the ordinary flues, cap, and wire gauze, for preventing the escape of sparks at the top of the chimney; also the funnel in the inner flue for increasing the draught."

A Cattle Pump; *A. Bailey, August* 3, 1839.—We have often remarked, that when we meet with a proposed improvement on pumps, we anticipate but little, as the requisites to a good instrument of this kind are well understood and well supplied. It frequently happens, therefore, that the proposed improvement manifests a want of knowledge on the principles of hydraulics, and of an acquaintance with what has been practically effected. Among the various schemes which have been proposed, that now placed before us is one of the most absurd, as it presents a very troublesome mode of arriving at sure defeat. A cylinder, twenty-eight inches in diameter, and a foot deep, is to be placed in the reservoir from which the water is to be raised: this cylinder, or tub, has a bottom furnished with a valve opening upwards to admit water. A piston is to be made of wood, two inches thick, which, when leathered, is to fit the cylinder. To this is to be attached a hollow tube which is to constitute the piston rod, and through this tube the water is to rise. The piston is to be forced down by causing an animal to ascend an inclined plane, or platform, bearing on the piston rod, and when the said animal retires, the piston is to be raised by means of a weight passing over a pulley. In the tubular piston rod there is a valve opening upwards; the water is to flow into a trough.

The claim is to "the hollow piston rod in combination with the trough, platform, and the piston, cylinder, and valves of the ordinary pump."

This will be a most effectual mode of applying the principle of the hydrostatic paradox to the bursting of the cylinder, or tub, or rather to the destroying of the twenty-eight inch piston of two inches in thickness, and to the forcing out of much more water round its packing than will find its way through the hollow piston rod.

A Machine for Sizing Paper; *W. W. Wilson and C. Dickerman, August* 3, 1839.—This machine is for dipping paper in the sheet into a circular tub, or vat, containing the sizing liquor. Instead of dipping it by hand, the paper is to be held in clamps at the lower end of slides set round, and carried by the revolution of a vertical shaft, the said slides having counter-weights attached to cords passing over pulleys.

"In using this machine, the workman employed in sizing the paper may dip all the respective portions successively without moving from his station, by merely causing the shaft and its appendages to revolve, in consequence of which arrangement a much larger quantity of work may be performed than by the ordinary apparatus."

The claim is to "the placing of such slides in such a manner as that they may be carried round by a revolving shaft in an apparatus constructed substantially in the manner and for the purpose set forth."

NOTES AND NOTICES.

Galloway's Patent Paddles.—An injunction has been obtained against the *British Queen* and the *President* steam ships, for using Galloway's patent paddles. Amicable negociation having failed to obtain compensation, and the example of large steamers using these wheels without license inducing other proprietors to do the same, Mr. Routledge, the assignee of the patent, it seems, felt himself compelled to take this step. The paddles of the *Great Western* are composed of three, and those of the *President* of two front boards each. The latter are fixed one before and the other behind the arm, in the common manner.

The Modern Progress of the Iron Manufacture is by few facts more strikingly exemplified than by this—that formerly it required more than four tons of engine coal for the production of one ton of iron, while, in consequence of the numerous improvements introduced, chiefly within the last thirty years, half a ton only is now the average quantity required; that is to say, above eight times the quantity of iron is obtained from the same engine power.—*Mechanics' Almanack.*

The Abstractions from the Atmosphere by the Iron Blast Furnaces is prodigious, yet to all seeming unfelt. The most copious well may be pumped dry—the largest steam generators exhausted; but what air engine has ever yet made any visible impression on the atmosphere? At the Dowlais Iron Works, where about 1200 tons of pig iron are made weekly, the prodigious quantity of 30,000 tons of air must be withdrawn weekly from the surrounding atmosphere, and passed literally through the "fiery furnace;" yet the void occasioned by this perpetual drain is constantly restored by means unknown to us, and without the smallest inconvenience to those who live and breathe in the same medium.—*Ibid.*

A Pint of Water converted into Two Hundred and Sixteen Gallons of Steam will raise thirty-seven tons a foot high; and if the steam is allowed to expand to double that volume, twice that weight. The greatest load ever lifted by any steam engine in England was by one in the Consolidated Mines in Cornwall, on the expansion principle, which raised a load of 90,000 lbs. seven feet six inches high every double stroke it made, and this nine times a minute.—*Ibid.*

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BURSILL'S PATENT WEIGHING MACHINES.

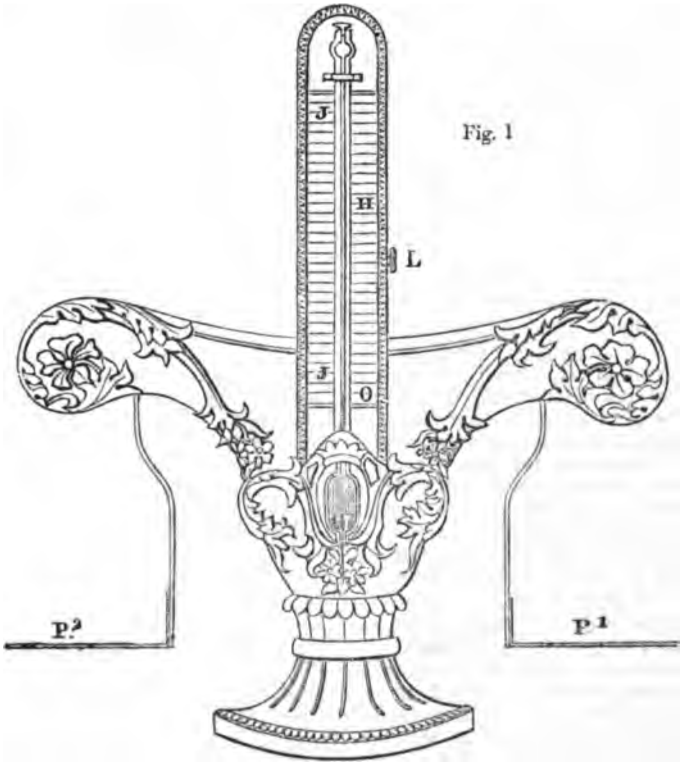


Fig. 1

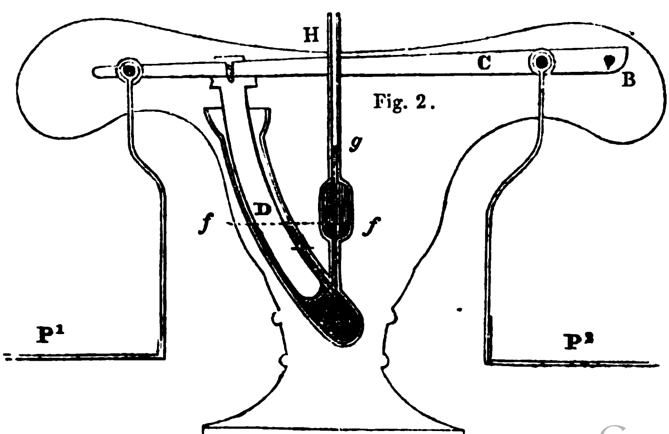


Fig. 2.

BURSILL'S PATENT WEIGHING MACHINES.

In our last number we gave a brief abstract of Mr. Bursill's recently enrolled specification for improvements in weighing and in weighing machines; we are now enabled to lay before our readers a more explicit account, explanatory of this gentleman's very beautiful and philosophical contrivances.

The idea is not wholly new, of indicating weights by the hydrostatic pressure of columns of fluids of unequal densities, as, for example, mercury and water, so that while the column of greatest density shall serve as the immediate determinator of the weights, the other column of least density shall indicate on an enlarged scale to the eye, the minuter variations of the heavier column; but it certainly has not been carried out in practice before, to the same extent as Mr. Bursill has done; a sufficient reason for which may be, that but for several auxiliary contrivances of Mr. Bursill's invention, of great originality and ingenuity, the double column principle as we may call it, could not be turned to any practical account whatever. These contrivances are, first a piston or plunger by the descent or rise of which in the mercurial column, the weight or pressure of the substances weighed is primarily ascertained; second, parallel guide rods to preserve the perpendicularity of the piston or plunger and so diminish friction; third, an apparatus to compensate in all cases for the effects of temperature on the indicator column; fourth, an adjustable index plate (the two last most necessary and valuable appendages to all machines used for weighing aeriform substances, barometers especially); and, fifth, the adoption in some cases of a curvilineal vessel for holding the mercury, whereby a great saving both of space and of mercury is effected.

The engravings on our front page represent a machine in which Mr. Bursill has very happily combined the double column principle and curvilineal form of mercurial holder, with the well known steelyard principle; so that very heavy as well as very lightweights may be ascertained by it with equal facility and exactness —by the use too of a comparatively small quantity of mercury, and with a single graduated scale.

Fig. 1 is an external front elevation; fig. 2, an internal section through the partly concealed mechanism. A is a curved cylindrical tube, made of any suitable material, but that which is found to answer best is well-baked pipe clay, to which mercury has less tendency to adhere than any other substance hitherto tried. Near its lower extremity this vessel has an open communication with the small upright glass tube H, which may be either left open to the atmosphere at top, or closed by a stopper; D is a piston moving freely up and down within the vessel A, and attached by a nut and screw on its upper end, to the steel-yard lever C, which is supported by a knife-edged fulcrum at B. The degree of curvature to be given to the mercurial vessel and piston, will of course depend upon the distance at which they are placed from the fulcrum: the curve being that portion of a circle described by a radius from the centre B. Mercury is poured into the vessel A till it rises to the point *f*: from *f* to *g* is filled with some fluid of less specific gravity than mercury — as water, oil, spirit, dilute acid, &c., to which a strong distinguishing colour should be given, as black, red, green, &c.

P^1 P^2 are two scale-pans, suspended from the steel-yard lever C; the one adapted for light, and the other for heavy weights. That for heavy weights P^1, is placed but a short distance from the fulcrum, while that for light weights P^2, is affixed at the farthest end of the lever. The distance between these pans may be so proportioned by calculation, that they shall indicate any definite proportional difference which may be desired; thus, for example, they may be so adjusted in relation to each other, that the one shall indicate pounds and ounces—the other ounces and drachms; while one graduated scale J, acting as an index to the vertical-indicator tube, will serve equally well for both. When the respective positions of the two scale-pans have been determined, weights are to be placed in them alternately, and the results marked down upon the index plate J, J, which is moveable, being raised or lowered by the adjusting nut L.

The zero point (0) of this scale being brought to an exact level with the top of the coloured fluid in the tube H, it will be obvious from these arrangements, that on placing a weight in either scale-pan, the piston D will be depressed, which, displacing a quantity of mercury in the holder A, will cause that in the

tube H to ascend, raising the water or other coloured fluid above it. It will be obvious also that the rise of the coloured fluid in the tube H will be greater than the excess of the vertical rise of the mercury in the vessel A beyond the vertical rise of that in the smaller tube, exactly in the proportion in which the coloured fluid is of less specific gravity than the mercury. When water is employed with mercury, the range will be about twelve times greater in the tube H than in the mercurial vessel A. The application of Mr. Bursill's improvements to the barometer, promises to impart to that valuable instrument a degree of precision of which it has never yet been able to boast; but this branch of the subject we must reserve for some future opportunity.

A REJOINDER TO MR. HOLEBROOK, FURTHER ESTABLISHING THE SUPERIORITY OF SCREW-PROPELLERS OVER PADDLE-WHEELS.

Sir,—Permit me, in the first place, to acknowledge the perfect liberality with which you have opened the columns of your valuable publication for the insertion of every argument relative to *screw-propellers* and *paddle-wheels*, and for the strict impartiality with which you have proceeded during the discussion on this subject. It is a matter of the highest national importance, however inefficiently it may have been handled by Mr. Holebrook or myself; and by affording to the combatants, as you have done, "a clear stage and no favour," the *Mechanics' Magazine* has established its reputation, not only for fair play, but as being the leader in bringing under public consideration the merits of a felicitous adaptation of a discovery made 2,000 years ago by the great mathematician of Syracuse, which will soon produce a change in steam navigation more important than any that has yet appeared.

Mr. Holebrook having had two shots to my one, seems by his concluding paragraph to be desirous of retreating from the contest, without allowing to his adversary the same advantage that he has had himself of shivering a second lance in the combat. To this unknightly proposal I am not disposed to succumb, nor do I believe that you, Mr. Editor, as Marshal of the Lists, would so far outrage the laws of chivalry as to deprive me of the right to try a second tilt in the tourney as well as my opponent. As the inventor of a particular kind of paddle-wheel, it may easily be understood why Mr. Holebrook should endeavour to depreciate the screw; but he can hardly expect that the public will acquiesce in a hypothesis founded upon errors and misstatements, particularly when reference can be made to the results of *experiments*, sufficiently attesting the fallacy of his conclusions.

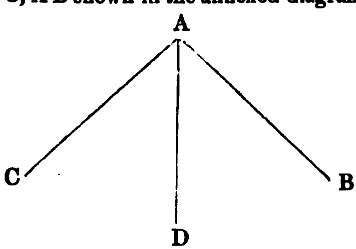
Mr. Holebrook's reply has certainly not strengthened his original position, and the mistakes he has made almost induce me to exclaim, "*natis sepulchro ipse est parens*," for Mr. Holebrook will assuredly be the death of paddle-wheels if he persists in their defence. He reiterates his claim, indeed, to the support of authority and facts, while neither can be adduced in favour of his theory. Authority he has misapplied, and facts are upon the whole against him. First, as to his theory.

1. As a foundation he quotes the deductions of science, in cases when the action of the power is parallel with the *surface* of the plane. In the screw it is parallel with the *base;* and not one of the principles he adduces in support of his conclusions is, as he supposes, in the slightest degree applicable. Any one acquainted with the theory of fluids would have perceived that the admission of my mode of stating the manner in which the resistance arising from inertia operates, was at once a confession of the erroneousness of Mr. Holebrook's calculations, so far as *theory* extends. It must be clear to any one who rightly considers the nature of a screw's action, that it is scarcely possible to imagine a mechanical means of propulsion possessing greater advantages. There is theoretically *no* loss of power from indirect action, as in the paddle-wheel; the screw affords the greatest surface in the smallest space; there is a positive gain of power in the screw itself; and it is possible to give to it almost any amount of additional speed. To these should be added the important advantages of position, security from shot, continuous action, uninterrupted by different degrees of displacement, as the ship may chance to be heavily or lightly laden, or as she may happen to pitch or roll in the waves.

I repeat, Sir, that Mr. Holebrook is altogether wrong in supposing that any

of the recorded laws of mechanical and hydrostatical science can be correctly applied, as he has applied them, to elucidate the action of the screw. For my own part, I went upon one simple fact, to which I made what is known of the laws of fluids subservient; and I never supposed that the results I gave as the theory of the screw's action would be fully borne out in practice; but I maintain, that so far as theory, with respect to fluids, can be sustained by facts, so far what I stated has been proved to be correct. *I defy Mr. Holebrook to produce one authority, or one fact, that legitimately supports his notion of a screw's action.*

2. Captain Chappell having given public notice of his willingness to afford every information in his power respecting screw-propellers, I presumed to put some questions to that gentleman, to which he gave a most obliging and immediate reply. Mr. Holebrook had asserted that it was very easy to understand how the action of the screw facilitated the turning of the ship's head, as such a result would necessarily follow from the difference between the resistance to the upper and under parts of the screw. According to his theory, the lateral resistance to the screw in motion may be represented by the two lines A C, A B shown in the annexed diagram,



A D being the axis of the screw; and whichever is taken to be the resistance to the under parts, the vessel's head will be inclined to that side by the action of the screw, the helm meanwhile being kept amidships. I therefore asked Capt. Chappell the following question:—

"When the ship has not gathered head-way, does the rotation of the screw alter the position of the ship's head, supposing the helm to be kept amidships?"

Captain Chappell replied—

"The rotation of the screw has *no effect whatever* upon the ship's head, unless the helm be inclined to port or starboard."

This, Mr. Editor, is precisely what I should have concluded from the peculiar action of the screw, "*according to the recorded laws of mechanical and hydrostatical science,*" though it is in direct contradiction to Mr. Holebrook's hypothesis. He has imagined that I mistook what he asserted on this subject; I can assure him that I did not, but I saw he was labouring under a delusion, and I endeavoured to set him right. In a note to the above question I said, "I take it for granted that Captain Chappell meant that the screw acted on the rudder when it was inclined one way or the other for casting." He replied—"You are quite right in this supposition." It was not, however, Mr. Holebrook's fault, perhaps, that he misunderstood Captain Chappell's observation, relative to the effect of the screw upon the rudder, since the error of Mr. Holebrook may have arisen from the misfortune of his having undertaken the discussion of a matter he was wholly unacquainted with.

Mr. Holebrook has further endeavoured to account for the lateral action he supposes to exist not being felt when the ship was under way; but it is manifest, that did it exist it must be felt, for the underneath lateral resistance will always be capable of a resolution into a constant force represented by the line A C or A B, and always exceed the contrary constant force of the upper lateral resistance; wherefore I asked Captain Chappell,

"When the ship has gathered headway, does the action of the screw constantly tend to force the vessel's head out of a straight course, in one particular direction, when going forward, and the contrary when going astern?"

He replied—

"If the screw revolves one way, it gives the ship headway; if the contrary way, it gives her sternway; but let the screw revolve which way it will, no alteration of the ship's head is effected but by inclining the rudder to port or starboard. When the screw is going, its action on both sides of the rudder is so equable that it keeps the ship's head as it were *nailed* to one direction, so long as the helm is kept amidships."

This is plainly confirmatory of my statement; and what Mr. Holebrook

says about bearing, seems to me the very thing that occurs: the rudder constantly recedes from the rush of water, and the screw as constantly keeps up the stream in full force, thus turning the ship's stern, and consequently her head, as if revolving on a pivot.

With regard to Mr. Holebrook's two irresistible suppositions, I have only to observe that I was not stating the actual practical results; but endeavouring to arrive at a proximate theoretical explication of so novel an application of mechanical power: and those two suppositions do not in the least affect the truth of my theory. I may here add, that it has come to my knowledge from unquestionable authority, that Mr. Brunel, in a very able report upon this subject, made to the Great Western Steam Ship Company, has conclusively established the superior propulsive qualities of the screw, upon data furnished by various experiments made under his own superintendence on board the *Archimedes*, as well as on board the *Great Western* steam ship; so that the incorrectness of Mr. Holebrook's views is proved, and the principle of screw propulsion found to be strictly consonant to science and fact, upon the testimony and judgment of an eminent engineer, who is wholly disinterested in the question at issue relative to the comparative merits of screw propellers and paddle wheels.

Mr. Holebrook has further endeavoured to prove, that the steam-engines of the *Archimedes* were of greater power than is represented. Upon this point also I made inquiry, and find that the aggregate power of the engines was determined upon two or three occasions by the application of an indicator; and as to Mr. Claxton having mistaken the diameter of the paddle-wheels, I believe him to have been quite correct in his calculation; and I much doubt if the *Archimedes* steam machinery would drive paddle-wheels of that diameter at the rate of 25 revolutions per minute, much less if those wheels had been of a diameter sufficient to enable the vessel to attain her present average speed. Upon referring to Captain Chappell's clever pamphlet, I find that in the Caledonian Canal, when there was smooth water and no tide, the *Archimedes* averaged *nine* knots an hour, which gives a slip of very little more than one-sixth, showing a result similar to what Mr. Brunel is said to have attained by another method —so that it is evident Mr. Holebrook, however ingeniously he may attempt to excuse his error, had, as I asserted, fallen into great confusion upon this part of the subject. The *slip*, as I should define it, is the difference between the speed gone, and the speed *possible to be gone*, such, that the screw, instead of passing rectilineally the length of its axis at each turn, passes some less distance, varying according to the rectilineal velocity imparted to the body to which it is affixed; and arising from the imperfect resistance offered by the medium in which it acts. Upon what principle, however one is to assume a slip of 14 miles, more than there is any possibility of the ship's going, I really am unable to comprehend.

I freely acknowledge that some of Mr. Holebrook's perpendiculars would impinge upon the rudder, though few and far between, and greatly impeded by the interposition of the stern post; but I cannot imagine any such violent action as is said to be observable, though fact is again rather more in my favour than against me.

As to the angle 48°. 20′ I must have looked out by mistake the log. tan. 9.994, &c., instead of 9.94, &c., which makes the difference. However this might very well be stated as 45° in round numbers: and I still maintain that the angle only matters *in theory*, as it affects the length of axis necessary to ensure a certain speed in a certain number of revolutions. Experience will decide this!

With regard to the success of the screw, Mr. Holebrook may rest assured that both the Admiralty and the Great Western Steam Ship Company have openly avowed its adoption; and several vessels upon this principle are constructing in different quarters by private individuals. A company has been formed at Bremen for building two steam screw ships to run between the Weser and New York! and another association is engaged in introducing the screw upon the canals and rivers of Belgium and Holland, so that there is every probability of our controversy being soon set at rest by experience.

Mr. Holebrook has made some comment upon the *Archimedes* being laid up *unsold* in the East India Docks. Will he inform us why hundreds of other fast steamers are in the same situation, including, unless I am much misinform-

ed, the flying *Eclipse* lately constructed by Mr. David Napier? May not the season of year account for this inaction, rather than any want of merit in any of those vessels?

In conclusion, I may remark, that though it might be satisfactory to Mr. Holebrook to leave the public under an impression that he had not fallen into the blunders he has committed, yet truth and fair play have compelled me to expose them. At the suggestion of that gentleman, I shall now quit the field, to return to it again, however, should any further attempt be made by Mr. Holebrook to call in question *the manifest superiority of screw propellers over paddle wheels!*

I am, Sir, with great respect,
Your most obedient srvant,
ROGER PHILLIPS.

Whitehaven.

ON THE PHENOMENA OF MOTION.

Sir,—Your very laudably inquisitive and persevering correspondent Mr. G. A. Wigney, is entitled to particular notice. I say the same of E. A. M.; from both agitating questions and combating opinions with the desire of arriving at truth, and after a manner for the public, and not indvidual benefit alone.

Every phenomenon in the manufactory, and in the laboratory, is performed by the powers of nature, equally as every planetary phenomenon. Hence the philosophy or procedure of nature is common to the whole. Nature's procedure not being understood, all description on our part must be mere guess work; and stands self-proved as such in the want of unity of opinion between man and man, or say, between all philosophers.

The present-day-philosophy does not warrant the natural fact, in any one instance whatever, being arrived at by either observation or experiment, or both; because it does not set forth, that observation does *not* extend beyond the sensations promoted by externals and which, but seemingly, are qualities of their outward causes; and because, experiments are never accounted for on the *only* fundamental principle on which a system of physical philosophy can with consistency be possibly founded—INERTIA, the inertia of atomic matter universally; therefore of bodies universally. On the contrary, we adopt inertia as a physical cause, and imitatively fall into the blunder, the *vis* INERTIÆ of matter, that is, the force of inability—the power of impotency—and this on the highest authority in science!

E. A. M. asks, in a short question, that which eighteen hundred years have not answered; she only asks, "why a billiard ball runs away when it is hit?" I answer; it is pressed away or forward. She adds, "on this pivot the most interesting experiments, at present in hand, may be said to hang." Aristotle says, "he who does not understand motion is ignorant of all things." And why? but because the like of our sense-excited-perceptions do not belong to matter or bodies—because in knowing only these we know nothing of bodies—and because no effect can by possibility be produced on inert matter but of a local nature or change of place, which is motion; for which pressure in the whole of nature, is the only analogous cause. The province of philosophy is to make known the cause of motion; and "the whole of true philosophy, the philosophy of nature, consists in the science of cause."

The functions of our senses teach, that light, colour, heat, cold, sound, flavour, and odour, from being sensations, yet seeming to belong to bodies, are not material agents. Inertia teaches, that matter has no self-acting assented properties, what then can be referred to as cause but the general pressure, under which all things exist and without which there would be no bodily formation, no decomposition and intermixture, no growth, no life, no planetary motion. Hence, instead of "a few experiments depending," there is not, nor ever has been, a single phenomenon understood or but falsely illustrated, nor ever will, without the knowledge of motion."

I beg to refer the reader to Messrs. Whittaker, the booksellers, who have, and now own, my work on the subject, which answers the question: What is the cause of continuous motion? My work cannot be understood by piecemeal, only by its being *studied rudimentally*.

T. H. PASLEY.

November 6, 1840.

LATENT HEAT—CIRCULATION OF THE BLOOD—REPLY TO MR. WIGNEY.

Sir,—In reply to Mr. Wigney's remarks in your No. 893, where he so

gallantly sounds the tocsin to discussion, I must assure him, I feel no hesitation whatever in responding to his call, and rendering whatever aid I can in answer to his interrogatories; but I may perhaps be allowed to observe, that very little utility can be expected to arise from hypothetical observations on natural phenomena, however plausible they may appear, unless accompanied with ready reference and applicability to ascertained facts and experimental proofs. The value of philosophical argument must consist in an intelligent concentration of reasoning and results; and subjects argued by conflicting opinions founded in a mere play upon words, like the collision of flint and steel, may throw out some sparks to dazzle the eye, but give no tangible result, and leave impressions on the minds of the general reader, perhaps more calculated to puzzle than instruct.

The question Mr. Wigney raises, namely —whether a perfect vacuum so called, created within the receiver of an air pump, would not be occupied by the presence of caloric? may undoubtedly be answered in the affirmative, so far as its presence is indicated by its effects, in accordance with that diffusive power, by which, though conducted by some classes of bodies with more facility than others it is permeable to all; but I agree not with Mr. Wigney's further conclusion, that it there becomes latent, that is, insensible or inactive heat. It is proved to exist under the condition of free or positive caloric, by placing a thermometer cooled below the temperature of the surrounding atmosphere, in the interior of the exhausted receiver, when it will be found quickly to rise to the same point, and be subject to the same fluctuations as take place in the external air.

Probably this imponderable fluid caloric, known to us by its peculiar features so distinct from the usual properties of matter, may be that subtle ether, which there is reason to believe occupies the vast extent of universal space and is the cause of the obstruction which the comets appear to meet with in their rapid course, as shown by their luminous atmosphere being trailed behind in the form of a tail. On this supposition caloric will be common to all planets and systems, and consequently, in connexion with the earth, will not require to gravitate as do other forms of matter to preserve its equilibrium. This would fully account for the perfect absence of weight that distinguishes it, and forms so forcible an argument for its immateriality.

Mr. T. H. Pasley in the same number of your Magazine, attempts to set the question at rest by a mystification of cause and effect that contains within itself a sufficient contradiction. Modestly condemning the popular error, that heat expands the thermometric fluid, we are thereby enforced to disbelieve the evidence of our senses! We are informed that "substance" is the cause of its increase of volume, when the tube being hermetically sealed no substance can obtain admittance. And then we have another version of the subject, arguing that physical force expands the said column of mercury when none can possibly be exerted without fracturing the glass tube. It is also propounded that heat and its effects are only known to us through the medium of the nerves of the feeling sense—situate and supposed at the fingers ends; and when the fingers ends shall happen to get burnt, it is not the fire we feel, but a sensation with which we have unfortunately become acquainted!

In answer to Mr. Wigney's queries on the subject of the flow of the blood, I have no theory of my own to propose, or anything calculated to throw new light on the subject, as the researches and conclusions of anatomists appear very satisfactory—so far as their observations and experiments have extended. It is argued that the valves of the heart exert their projectile force in propelling the blood through the vascular system independently of any source of motion contained within the blood itself, but that this action is kept in constant play by a quickening stimulus exerted by the blood upon the interior surface of the heart in contact with it. This application of stimulus is kept constantly maintained by the high temperature resulting from chemical action with atmospheric air in the process of breathing.

To the same condition of vital sensibility and activity, constantly supported by the stimulating influence of the blood which maintains the muscular system in its power of creating physical motion at the will of the person, may be attributed the action of the heart with the distinction that it is kept in unceasing play by a motive power peculiar to itself. If it

be admitted that the principle of life, which gives to man command at will over the nervous and muscular system of the body, may also support the muscular action of the heart without intermission—and I see no reason to doubt it—then is it shown by its structure, as I endeavoured to point out in a former communication, to be well adapted to the purpose of propelling the blood through the human frame; there appearing no ground for attributing inherent activity to the blood, when so perfect a means of accounting for its motion is exhibited in the valvular action of the heart itself—this action being kept in constant repetition by the continued application of the stimulating influence itself.

The arteries themselves are proved by experiment to be possessed of a vital power of contraction, by which they assist in keeping the circulation constant and equable. In the smaller arteries, where considerable obstruction would be met with from friction, a compensating power exists, by which the flow of the blood, instead of being retarded, is aided in its course.

At every injection of blood into the arteries by the action of the heart, their elastic structure becomes expanded to a certain tension by the force of the current, and it is their contraction again at the intermediate periods, with a greater amount of force or pressure than was expended in their distension, which adds to the momentum of their contents, and tends to overcome the resistance which is met with in their passage through the intricate net-work of the smaller vessels.

Mr. Wigney inquires if the arteries are destitute of air-vessels, serving the same purpose as the pipes in his refrigerator? A kind of exterior tube I presume is meant, encircling them for the conveyance of a current of refrigerating fluid, or any adaptation of structure likely to assist in his analogy; but no such peculiarity of construction has been yet observed by physiologists; the three distinct coats of which each arterial tube is composed, existing in close and immediate contact with each other. Unluckily for Mr. Wigney's inference that the primary cause of circulation of the blood is due to the impartation of heat to it in its passage through the lungs—the effect is just contrary to that which is demanded by the laws of hydrostatics. When the lower portion of any fluid receives an increase of temperature, it is thereby rendered of lighter specific gravity and rises to the surface, while the remaining portion of the liquid that has received no impartation of heat, descends to take its place and restore the equilibrium. If the supply of heat is maintained, this effect will be continuous and a constant circulation of the fluid be the result. It is at once perceived that the course which is pursued by the blood is just the reverse of this, on receiving its supply of heat the arterial fluid courses downward at a very rapid rate, from the heart to the extremities, and gradually decreases in temperature as it ascends through the veins during the period of its return to the lungs. Leaving the subject to Mr. Wigney's further cogitation,

I remain, Sir,
Your obedient servant,
A. Y.

Brighton, Oct. 3, 1840.

RHODIUM v. EVERLASTING PENS.

Sir,—Your correspondent "Plume," in your last Number, is in error, when adverting to what he terms Mr. Hawkins's *rhodium* pens.

Dr. Wollaston, the discoverer of rhodium in 1803, applied nibs formed of that metal to a pen, its extreme hardness and toughness seeming to afford promise of great durability. The result justified his expectations, and a few similar pens were made for sale.

The rhodium pens of the present day, however, are altogether guiltless of the presence of any of that scarce and valuable metal; they are now formed of an alloy of platinum mostly with tin, but this alloy unfortunately becomes brittle and fragile in proportion to its hardness; the *toughness* of the rhodium is always wanting.

Ruby pens, i.e. ruby nibs set in fine gold, form a very durable pen, but Mr. Hawkins professes to have discovered a natural metallic alloy* much harder, and therefore more lasting than any of the foregoing.

Tolerably convincing proofs are given of the durability of the nibs of these pens, which Mr. Hawkins significantly designates "everlasting;" and it is only to be regretted that their costliness for-

* Rhodium is found in combination with platinum and palladium.

bids their use to most of those "who have much writing to do."

I am, Sir,

Yours respectfully,

Wm. Baddeley.

December 7th, 1840.

HAWKINS'S EVERLASTING PEN.

Sir,—Your correspondent "Plume," in the last Number of your valuable Magazine, page 519, has sadly degraded my pen by calling it *a Rhodium Pen*.

It is well known that the continued use of a rhodium pen will so wear away the nibs in about six months, as to render it unfit for good writing; while the nibs of my pen exhibit no appearance of wearing by six years of constant use. I therefore have advisedly and confidently assumed the term Everlasting Pen, in the full persuasion that the natural alloy of which the nibs are made will endure daily use for ages, and that the pens will become heirlooms in families.

My experience of their excessive hardness and durability leads to the conclusion that some seventh descendant of a great author of the present day may, 200 years hence, in a letter to a friend, say, "I address you by means of the pen with which my great grandfather's great great grandfather wrote the whole of his voluminous works, and which pen has been actively employed by all my ancestors since his time, and is still a good pen."

I am, Sir,

Your most obedient servant,

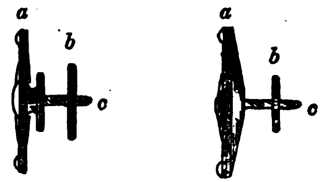
John Isaac Hawkins.

Quality-court, Chancery-lane, Dec. 8, 1840.

BACHELOR'S BUTTONS—SELF-ACTING CANDLE EXTINGUISHER.

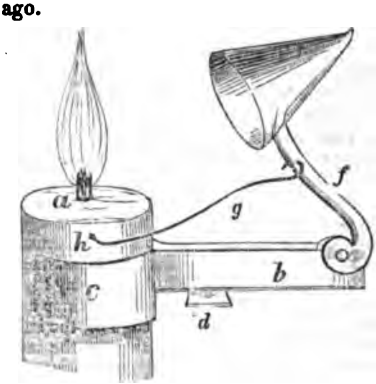
Sir,—Mr. Baddeley's account of the bachelor's button in the *Mechanics' Magazine*, part 212, as well as the Frenchman's statement of his supposed novelty in the daily papers, has induced me to send you two buttons with screw shanks and nuts, manufactured 12 years since by Messrs. Edward Woodcock and Son, working jewellers, London.

If worthy a place in your valuable journal will you oblige your numerous readers with a sketch of them? [They are represented in these two engravings:



a being the front of the button; *b* a screwed shank, and *c* the nut by which they are attached to the garment. In the one instance the button stands out from the apparel by means of a shoulder—in the other case by the inclined position of its back only. Ed. M.M.]

I also transmit you a rough sketch of a self-acting extinguisher invented by the same persons upwards of 14 years ago.



a, Candle.

b, A steel spring clasping the candle firmly with its jaws.

c, Jaws of the spring.

d, A wing on each side of the spring to facilitate the removal of the apparatus from the candle.

e, Joint.

f, Arm of the extinguisher.

g, A small pin of No. 20 wire loosely fastened to the arm *f*.

h, The sharp point of the wire is pushed into the candle at a short distance from the wick, as soon as the tallow is melted, the wire lowers its support, and the weight of the extinguisher carries it forward on the wick and the light is put out.

I am, Sir,

Your most obedient servant,

P. C. Williams.

November 30, 1840.

HOWARD'S SYSTEM OF CONDENSATION—REPLY TO MR. SYMINGTON.

Sir,—I shall not follow Mr. Symington's example of personal recrimination; his remarks in your last number, with regard to *myself*, may pass for what they are worth—or even he may deem them worth—except only one, namely, that I made on a former occasion, "a public apology to him for a hasty assertion." I did no such thing, and he is not entitled to put this construction on a courteous mode of expression or explanation on my part. But never mind; in matters of this kind I am of the poet's opinion—

> "Where there's no honour to be gained,
> 'Tis credit lost in being maintained."

Truth, Mr. Editor, is said to live in a well; and if by throwing in a pebble I should cause our friend to show his honest face above ground, even for a short time, for he is very shy, I shall be satisfied, and the cause of truth and the progress of science—for *this* is the subject at issue—will be benefitted; and I am happy to note that your journal, being open to all parties and of great circulation, now aids the good cause not a little.

I asserted that in the manner set forth a saving of a fourth of the fuel could not be made in the *Dragon*. I again assert this, unless indeed it be accompanied with a corresponding *saving of speed*, and the *Dragon*, I admit, is entitled to the palm of economy in the latter respect What! by an *alternate* use of the plan for two hours for a-day? A moment's consideration must convince any man having the least knowledge of the subject, that under *such circumstances* the saving of fuel cannot even be appreciated.

But Mr. Symington goes further than this, and states most unequivocally that a saving of *one-third* of the fuel was effected in the *City of Londonderry*. Now, Sir, what is the *truth* with respect to this vessel. On applying to the Peninsular Company, as I before stated, on the infringement of my patent, I communicated with one of the leading Directors, a gentleman whose character is above suspicion, and well versed in matters relating to steam navigation, and he informed me, in the presence of a friend who happened to be with me, that the exterior pipe of Mr. Symington, when used *alone*, reduced the speed of the engines to *twelve* strokes per minute, or about one-half—that he was of opinion that it retarded the vessel's way nearly a mile an hour from its position—and, further, that Mr. Symington proposed to divide the large pipe into many smaller ones, if the Company proceeded with the work (being a still closer approximation to the practical carrying out of my invention), but which he assured me should not, under the circumstances, be permitted. He further and fairly stated, that the application gave indications of advantage, so far as could be ascertained by such imperfect means. As to the saving of fuel—the *effect* being regarded—but your readers may judge for themselves on this point. One-third, Mr. Symington! Oh, fie! I say again, that a perfectly efficient application of the method as practised by myself (I speak advisedly, as will appear in due time), *now and long before* Mr. Symington's patent, or rather *specification*, cannot produce this effect; and, I repeat it, I should be ashamed to practise such deception; and, moreover, I will not suffer others to do it unreproved.

Deferring my promised exposition of the method of condensation by reinjection for a short time,

I am, Sir,
Your most obedient servant,
THOMAS HOWARD.

King and Queen Iron Works, Rotherhithe,
7th December, 1840.

MR. PEARCE'S CONCENTRIC VALVE.

Sir,—Having just come to town and read your number of the *Mechanics' Magazine* for October, I beg leave to remark, that it seems to me that Mr. Pearce's concentric valve for steam engines is but a modification of one formerly invented by a Mr. Murray, and liable to the same objection, viz.—the very great waste of steam, from the great length of the steam passages. It seems also that the friction for working it would be just as great, at least very nearly so, there would be also much more trouble in the adaptation of it.

Your obedient servant,
C. E. BAGOT, M.D.

12, Charlemont Place, Dublin.

SAFETY LOCK.

Sir,—The frequent accounts in the public journals of domestic robberies have induced the following idea of a kind of preventive. It consists in placing the lock so as to face the hinges, and the key-hole at the back of the jewel or other box.

To iron safes, in a stone or brick-work recess, and turning on a pivot, this plan might be advantageous. The lock may not be the best possible, but safe, from being out of reach of the picklock. In case of fire the wall will not ignite the safe, which might be padlock-secured, with the *same key*, and have the key-hole within the wall at night. T. H. P.

November 6th, 1840.

PROOF OF PROPOSITION XXIX, BOOK I OF EUCLID, INDEPENDENTLY OF AXIOM XII.

Sir,—The attempt to discover a simple proof of the 29th Proposition of the First Book of Euclid, without the assistance of the Twelfth Axiom, seems to be as favourite, though I hope not as futile, a pursuit in mathematics, as perpetual motion is in mechanics.

Kinclaven has very properly shown, that the assumption, drawn by Mr. Sankey from his otherwise clever demonstration at page 560 of your last volume, is quite unwarrantable: and still more inadmissible is Mr. Sankey's mode of forming an equilateral hexagon as described on the succeeding page; it is, in fact, a complete begging of the question: Mr. S. has neither described how the middle triangle is to be constructed; nor proved that, when constructed, it is equal to the others. I beg to hand you, for insertion in the *Mechanics' Magazine*, a simple proposition in nowise differing from the spirit of the First Book of Euclid. From it, the proof of the 29th Proposition will follow in the most direct manner. I shall leave it open to criticism for one month, when, if it be not proved inadmissible or inconsistent with the spirit of the First Book, I shall follow it up by another proposition still more simple, to which the proof of the 29th Proposition shall be a corollary.

I am, Sir, your obedient servant,

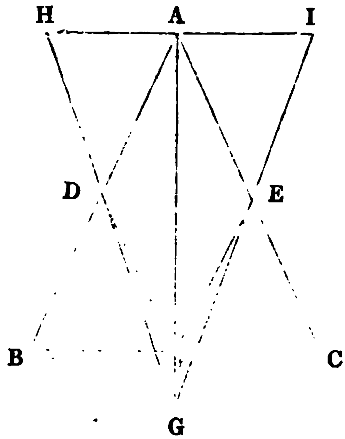
NAUTILUS.

Prop. A. Theor.

If the base and the sides of an isosceles triangle be bisected; and if straight lines be drawn from the points of bisection in the sides, to the point of bisection in the base; the two triangles so formed upon the base are also isosceles.

Let A B C be an isosceles triangle, bisected in the sides and base at the points D E F; join D F, E F. The triangles B D F, C E F, are isosceles.

For, if the triangle B D F, be not isosceles, let the side D B be longer than D F. Join A F, and because A F is drawn from the vertex of an isosceles triangle and bisects its base, it is perpendicular to the base, and also bisects the vertex angle B A C (9th and 11th of 1st). In A F produced, take a point G, so that D G shall equal D B; join D G, E G, B G; then, since G A, A D, are equal to G A, A E; and the angles at the vertex equal by bisection; the bases D G, E G, are also equal, and the angle D G E is bisected by A G (4th of 1st). Produce G D, G E; and make D H, E I, each equal to D B: join H I, and because H I is the base of the isosceles triangle H G I, of which G A bisects the angle at the vertex, therefore, G A is perpendicular to H I (12th of 1st.)



Because D H, D A, D B, D G, are equal, and the vertical angles at D, also equal (15th); therefore, the base H A, is equal to the base B G (4th).

But, because, in the triangle B F G, the angle B F G is a right angle, and therefore, the angle B G F (equal to B G A) less than a right angle (17th).

Therefore, in the two triangles B G A, H A G, having the sides B G, G A; equal to the sides H A, A G; but the contained angle H A G, which is a right angle, greater than the contained angle B G A, which is less than a right angle; the third side H G is greater than the third side B A (24th); take away the equals H D, A D, and there remains D G greater than D B.

Therefore, D G is not equal to D B; neither can it be equal to it, so long as the triangle B F G exists; and since the triangle B F G must exist if the point G be taken any where in A G, but in the point F; therefore, D G must be equal to D F, and, consequently, D F is equal to D B, and the triangle B D F is isosceles.

But the triangle F E C has equal sides and base with the triangle F D B, therefore it also is isosceles (8th).

Wherefore if the sides, &c.

Q. E. D.

Cor. A straight line drawn across an isosceles triangle through the points that bisect its equal sides, is at right angles with the perpendicular to the base, and also bisects it.

A PARTING WORD FROM "SCALPEL," ON MR. HALL'S CONDENSATION.

Sir,—Had "Honestometer" contented himself with wrong deductions from premises, I should have "left him alone in his glory." But he has boldly asserted, that "'Scalpel' has indulged in gross personalities towards Mr. Hall from the commencement of his correspondence with you." Will "Honestometer" permit me to inform him, with all imaginable politeness, that the first essential for a writer is truth; that he ought to "nothing extenuate nor set down aught in malice," and never to let his zeal or imagination supply his facts. Why he, also, should follow the dangerous path of his predecessors to commence personal attacks upon poor me, instead of confining himself to the subject matter, it might not be difficult to determine. Excepting my first paper there is no approach even to one gross personality towards Mr. Hall, but just the contrary. In that paper an observation in reference to his dispute with Mr. Holebrook, and which one of your correspondents has termed mere harmless jocularity, is the sum of my offence. As to others, the lesson may serve to introduce a more wholesome state of discussion, since I attacked none who did not throw the first stone. In this respect, as also in other parts of "Honestometer's" last, he has lain himself open to much severity of reply, but I shall follow the directions of old Isaak Walton how to skewer and serve up a frog—"treat him gently, as though you loved him." A few observations will suffice.

To go over the same ground again to satisfy "Honestometer" of "his terrible mistake," would be a waste of time, and an impertinent occupation of your columns, of which this discussion has already had more than its share. That only master of the pickaxe style of composition, Will. Cobbett, observes, with the interesting modesty for which he was so distinguished—"When I am asked what books a young man or young woman ought to read, I *always* answer, let him or her read *all the books that I have written*," (only 100 vols.), adding, that it was his "*duty*" to give this recommendation. Now, I don't ask "Honestometer" to read *all* my papers—for that would be too severe an infliction—but it is my *duty* to refer him to those which have before so fully treated on the subject. He will find his error in the ten top lines of his paper, p. 333, No. 894, which, with all his "*masculine* knowledge of science," he could never have made, had he sufficiently understood the principles of the steam engine to write about them, or attentively considered this discussion. He safely asks me who are the scientific men who *now* admit the fallacy of Mr. Hall's system? He did not expect me to betray the conventional confidence of society, and make public their names, and thus he would snatch a triumph from my silence. But does he not perceive, that to disprove my statement he must take his evidence from the present to which my *now* applies, and not as he has done from the past. This is neither argument, "Honestometer," nor refutation. You should have told us who has ordered these condensers since their merits were investigated by "Scalpel?" not who used them before. But probably you had in view that Horatian precept, "Omnia vult belle Matho dicere—dic aliquando et bene, *dic neutrum*, DIC ALIQUANDO MALE."

Had Mr. Hall's advocates been satisfied with claiming for his system only those advantages which I have fully admitted it does possess, this discussion could not have arisen. But those only who have been accustomed to weigh conflicting testimonies of a past time, and to draw truths from a mass of rubbish, can sufficiently estimate the injury of allowing errors of science to be received as truths, particularly as if apparently established by experiments. It is the sure barrier against all future improvement. The great increase of power insisted upon, and inferred from the numerous certificates of managable engineers, who had too easily been led to give them without sufficient examination, is "the fallacy" I have shewn, and which *is now* admitted.

This discussion brings to mind two eras of my reading which so appropriately well illustrate all such desultory treatment of a subject, that in finally withdrawing from further part in it, I beg excuse for introducing them. One I consider the foundation of all sound learning, the other a guide for successful controversy. Had they been acted upon, one half the books had never been written, and this matter had terminated with my second paper.

Magliabechi was a cormorant by the tree of knowledge: he passed all his life among his books, and knew nearly every thing. A living library, he died at eighty, but so little was he capable of digesting what he had read that he could not make use of it, and all he

produced from his immense stores was this memorable observation, "It is not sufficient to become learned to have read much, if we read without reflection."

The other instance is still more remarkable, as a warning to those who, however great their natural parts, rush into a controversy without a complete knowledge of their subject. That extraordinary genius, Hobbes, began mathematics at too late a period of his life (40) to make him equal in that science to another of very inferior ability, who had commenced at the proper age, and was a mere mathematician, and he got himself involved in a twenty years paper war with Dr. Wallis. He maintained a noble struggle, the true fire of genius blazing forth like a troubled volcano, but it was quenched by the cold unconsumable snows of mathematics. Nearly maddened, he was obliged at last to give in, and broke out with an exclamation which, not inappropriately perhaps, may be applied to the past discussion: "I alone am mad, or they are all out of their senses: so that no third opinion can be taken unless any will say that we are all mad."

I am, Sir,

Your obedient servant,

SCALPEL.

December 7, 1840.

ON THE CORROSION OF CAST AND WROUGHT IRON IN WATER. BY ROBERT MALLET, ESQ. ABSTRACT OF A PAPER COMMUNICATED TO THE INSTITUTION OF CIVIL ENGINEERS.

[This communication is one of those forwarded to the Institution in consequence of the Council having considered this subject a suitable one to compete for the Telford Premiums; and the author having been long engaged in making experiments on this subject at the request of the British Association, refers in the introductory part of this paper to the contents of that report, which may be viewed as a "*précis*" of the state of our knowledge on the subject to the year 1839, together with original researches forming the basis of the present results. This communication is accompanied by a most elaborate set of tables of results.]

From Mr. Mallet's experiments, it appears, that the metallic destruction or corrosion of the iron is a maximum in clear sea water of the temperature of 115° F.—that it is nearly as great in foul sea water —and a minimum in clear fresh river water. Iron under certain circumstances is subject to a peculiar increase of corrosive action—as, for instance, cast-iron piling at the mouth of tidal rivers—from the following cause. The salt water being of greater density than the fresh, forms at certain times of tide an under current, while the upper or surface water is fresh; these two strata of different constitution coming in contact with the metal, a voltaic pile of one solid and two fluid elements is formed; one portion of the metal will be in a positive state of electrical action with respect to the other, and the corrosive action on the former portion is augmented. The lower end of an iron pile, for instance, under the circumstances just mentioned, will be positive with respect to the other, and the corrosion of the lower part will be augmented by the negative state of the upper portion, while the upper will be *itself* preserved in the same proportion. From this theoretical view may be deduced the important practical conclusion, that the lower parts of all castings subject to this increased action should have increased scantling. The increased corrosive action of *foul sea* water may be referred to the quantity of hydrosulphuric acid disengaged from putrifying animal matter in the mud, convertiug the hydrated oxides and carbonate of iron into various sulphurets, which again are rapidly oxidized further under certain conditions, and becoming *sulphates* are washed away. Hence the rapid decay of iron in the sewerage of large cities, and of the bolts of marine engines exposed to the bilge water. The corrosive action being least in fresh water may be partly referred to this being a worse voltaic conducting fluid than salt water. It appears also that wrought iron suffers the greatest loss by corrosion in hot sea water; which fact has led the author to inquiries, with reference to marine boilers, at what point of concentration of the salt water, whether when most dilute, after the common salt has begun to deposit, or at a farther stage of concentration, the corrosive action on wrought iron is the greatest, and he points out the important practical use which can be made of this information. It appears also, that the removal of the exterior *skin* of a casting greatly increases the corrosive action of salt water and its combined air, so that the index of corrosion under these circumstances is not much less than that of wrought iron, and in clear river water is greater. It farther appears, that chilled cast iron corrodes faster than the same sort of cast iron cast in green sand, and that the size, scantling, and perhaps form of a casting, are elements in the rate of its corrosion in water. The explanation of these facts is to be found in the want of homogeneity of substance. and the consequent formation of numerous voltaic couples, by whose action the corrosion is promoted. It is also observable that the corroded surface of all these chilled specimens is tubular. It appears also that, in castings of equal weight, those of massive scantling have proportionately greater dura-

bility than those of attenuated ribs and feathers. Hence appears also the great advantage of having all castings, particularly those intended to be submerged, *cooled in the sand*, so as to insure the greatest possible uniformity of texture. The principles now stated afford an explanation of the fact often observed, that the back ribs of cast iron sheet piling decay much faster than the faces of the piles. It is also probable that castings in dry sand and loam will, for these reasons, be more durable than those cast in green sand. The general result of all these experiments gives a preference to the Welsh cast iron for aquatic purposes, and to those which possess closeness of grain. Generally, the more homogeneous, the denser and closer grained, and the less graphytic, the smaller is the index of corrosion for any given specimen or make of cast iron. The author next proceeds to the important question of the protection afforded by paints and varnishes. White lead perishes at once in foul water, both fresh and salt; and caoutchouc dissolved in petroleum appears the most durable in hot water, and asphaltum varnish or boiled coal tar laid on while the iron is hot under all circumstances. The zinc paint, which is now so much noticed as an article of commerce, the author has analyzed, and states its composition as

Sulphuret lead	9.05
Oxide zinc	4.15
Metallic zinc	81.71
Sesqui-oxide iron	0.14
Silica	1.81
Carbon	1.20
Loss	1.94
	100.

It may, *à priori*, be considered likely to produce a most excellent body for a sound and durable paint under water. The black oxide of manganese has no advantages but that of being a powerful drier. The defects of all oil paints arise from the instability of their bases; the acids which enter into the constitution of all fixed oils readily quit their weakly positive organic bases to form salts with the oxides of the metal on which they may be laid. Hence we must look for improvements in our paints to those substances among the organic groups which have greater stability than the fat or fixed oils, and which, in the place of being acid or Haloid, are basic or neutral. The heavy oily matter obtained from the distillation of resin, called "resenien," and eupion, obtained from rapeseed oil, have valuable properties as the bases of paints. Accompanying tables contain the results as to the corrosion of cast iron in sea water when exposed in voltaic contact with various alloys of copper and zinc, copper and tin, or either of these metals separately, per square inch of surface. It appears that neither brass nor gun-metal has any electro-chemical protective power over iron in water, but on the contrary promotes its corrosion. This question is only a particular case of the following general question—viz. if there be three metals, A, B, C, whereof A is electro-positive, and C electro-negative, with respect to B, and capable of forming various alloys, 2 A + C .... A + C .... A + 2 C: then if B be immersed in a solvent fluid in the presence of A, B will be electro-chemically preserved, and A corroded, and *vice versâ*. If B be so immersed in the presence of C, B will be dissolved or corroded, and C electro-chemically preserved; the amount of loss sustained in either case being determined according to Faraday's "general law of Volta-equivalents." The tables show that the loss sustained by cast iron in sea water, as compared to the loss sustained by an equal surface of the same cast iron in contact with copper, is 8.23: 11.37; and when the cast iron was in contact with an alloy containing 7 atoms of copper and 1 of zinc, the ratio was 8.23: 13.21; so that the addition in this proportion of an electro-*positive* metal to the copper produces an alloy (a new metal, in fact) with higher electro-negative powers, in respect to cast iron, than copper itself. The author discusses many results equally remarkable, and is therefore enabled to suggest by its chemical notation the alloy of "no action," or that which in the presence of iron and a solvent would neither accelerate nor retard its solution, one of the components of this alloy being slightly electro-negative, and the other slightly electro-positive, with respect to cast iron. These results will also enable some advances to be made towards the solution of the important problem proposed by the author in his former report, viz. "the obtaining a mode of electro-chemical protection, such that while the metal (iron) shall be preserved, the protector shall not be acted on, and the protection of which shall be invariable. Another table exhibits especially the results of the action of sea water on cast iron in the presence of copper and tin or their alloys. It appears that copper and tin being *both* electro-negative with respect to cast iron, all their alloys increase or accelerate the rate of corrosion of cast iron in a solvent, though in very variable degrees; the maximum increase is produced by tin alone, thus indicating that this metal (contrary to what was previously believed) is more electro-negative to cast iron than copper. Hence the important practical deduction, that, where submerged, works in iron must be in contact with either alloy, viz. brass or gun metal; common brass, or copper and zinc, is much to be preferred. These experiments will also

serve to demonstrate the fallacy of many of the patented so-called preservatives from oxidation, which are brought before the public with so much parade. The author lastly proceds to the subject of the specific gravity of cast iron, tables of which are added to the preceding. The specific gravities here recorded were taken on equal sized cubes of the several cast irons cut by the planing machine, from bars of equal size, cast at the same temperature in the same way, and cooled in equal times. Many of these results differ considerably from those given by Dr. Thompson and Mr. Fairbairn; which the author refers to the probability that those of Dr. Thompson were taken from pieces of the raw pig, and those of Mr. Fairbairn by weighing in air equal bulks cut from the mass by the chisel and file, by which latter process the volume is liable to condensation. The experiments of Mr. Fairbairn and Mr. Eaton Hodgkinson seem to show that the ultimate strength of cast iron is in the ratio of some function of the specific gravity dependent upon the following conditions: viz. 1, the bulk of the casting; 2, the depth or head of metal under which the casting was made; 3, the temperature at which the iron was poured into the mould; and 4, the rate at which the casting was cooled. In another table all the irons experimented on are arranged in classes, according to the character of the fracture: for which purpose the terms—1. silvery, 2. micaceous, 3. mottled, 4. bright grey, 5. dull grey, and 6. dark grey, have been adopted by the author as a sufficient basis on which to rest a uniform system of nomenclature for the physical characters of all cast irons, as recognizable by their fracture; and it is to be wished that experimenters in future would adopt this or some other uniform system of description, in place of the vague and often incorrect characteristics commonly attached to the appearance of the fracture of cast iron. A twelfth and last table contains the results of a set of experiments on the important subject of the increase of density conferred on cast iron, by being cast under a considerable head of metal, the amount of which condensation had not been previously reduced to numbers. It shows this increase of density in large castings, for every 2 feet in depth, from 2 to 14 feet deep of metal. A very rapid increase of density takes place at first, and below 4 feet in depth a nearly uniform increment of condensation. The importance of these results is obvious; for, if the ultimate cohesion of castings is as some function of their specific gravity, the results of experiments in relation to strength, *made on castings of different magnitudes, or cast under different heads*, can only be made comparable by involving their variable specific gravities in the calculation.—*Trans. Ins. Civ. Eng.*

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

The first meeting for the session of the Royal Institute of British Architects was held on Monday evening, the 7th inst., and most numerously attended; Earl de Grey in the chair.

Several scientific individuals residing abroad were unanimously elected honorary and corresponding members.

Charles Fowler, Esq., Honorary Secretary, read a list of some scarce works which had been presented to the institution, amongst which was one by Vitruvius, published in Italy in the 16th century, containing a description of a paddle-wheel and some motive engines, evincing the progress in mechanical science at that period.

An interesting communication on Gothic architecture was read by Mr. Poynder, illustrated by a series of drawings and plans, intended to prove that many complications of that order, which have been considered unnecessary, were designed by the early architects as a greater stability to the structure.

A drawing and plan of a splendid palace in the north of Europe, deposited by C. Tottie, Esq., was exhibited, as also an elevation of an old mansion-house still extant in England, and supposed to have been built by Inigo Jones, before the erection of the Banquetting House, Whitehall. A descriptive letter was read from C. J. Richardson, Esq., by whom the last-named drawing was made and presented.

Mr. Nottingham laid before the meeting specimens of Mr. Potts's newly invented rail moulding for hanging pictures, and pointed out to the members the great superiority of the rail over the ordinary rod hitherto used.

Thanks were voted to the respective contributors and to the noble chairman, and the meeting was adjourned.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

JAMES ROBERTS, OF SHEFFIELD, MERCHANT, *for an improved mode of fastening certain kinds of horn and hoof handles to the instruments requiring the same.*—Enrolment Office, Nov. 28, 1840.

These improvements relate, in the first instance, to horn handles for knives, forks, &c., which are composed of two pieces or scales. The horn being softened by heat, is pressed between a pair of dies or pincer moulds, which leaves a long deep cavity on the inner side; two dove-tailed pieces are riveted, one on each side of the tang of the knife or fork, which are forced into these cavities while the horn is in a soft state, by placing them in a clam or vice. In some cases, three double-headed studs are also forced into cavities in the horn, giving an

additional hold to the handles. 2ndly. When solid handles of these materials are to be used, they are to be bored down the centre; the tang having been serrated or notched, is driven into the horn while it is still soft, and closed upon the tang by pressing between dies as before described.

The claim is, for the fastening of softened horn and hoof handles, whether in the form of scales or solid, to knives and forks, by pressing the said softened horn or hoof over, round, or into projections or cavities formed on or in any way applied to the tang or any part answering to the tang; which mode of fastening is more durable than any plan before adopted, and supersedes the use of resin, so that the said knives and forks are enabled to be washed in hot water without the handles coming off, or becoming loose.

John George Shuttleworth, of Fernly-place, Glossop-road, Sheffield, Gentleman, *for certain improvements in railway and other propulsion.*—Enrolment Office, Nov. 28, 1840.

The contrivance of this gentleman bears a very close resemblance, in many parts, to the atmospheric railways long before the public, except that in the present instance the patentee proposes to employ a denser fluid (water) as the motive power. A horizontal main or tube is laid along the line between the rails, having a slot or opening on its upper surface; this aperture is smallest at the top, and expands downward. A piston fits the interior of this tube, and terminates in a peculiarly formed guide-neck, for taking up and applying to the aperture in the pipes a continuous flexible valve or stuffing of india rubber or other suitable material. In front of the guide-neck there is one vertical and one horizontal wheel, to guide the piston steadily along the line with the smallest possible quantity of friction; while a thin metal plate passes up through the opening, and is attached to a railway carriage of the ordinary construction. At the commencement of the line, a vertical pipe conveys a column of water on to the horizontal main, through a valve or cock opened or shut at pleasure. The efficiency of this agent may beproduced by the pressure of an elevated reservoir, or by the application of steam power to force it into the pipes. On turning the cock the water rushes into the main, and drives the piston, with the carriage to which it is attached, forward; the flexible valve, which lies along the bottom of the main, but passes through the guide-neck and up over the piston, is raised as the piston travels along, and forced into the opening of the pipes, where it is kept by the pressure of the water behind the piston.

The claim is—1st. The application of the power of a column or body of water acting against a piston in a tube, to which piston a railway carriage, or other object to be propelled, is fastened for the purpose of propulsion. 2nd. The improved guide-neck to the said piston for raising and conveying to its proper place the flexible valve or stuffing required to fill the slot or space left open in the upper part of the propelling tube for the passing of the plate.

Francis Greaves, of Radford-street, Sheffield, Manufacturer of Knives and Forks, *for improvements in the manufacture of knives and forks.*—Enrolment Office, Dec. 7, 1840.

These improvements relate to the manner in which handles are to be affixed to the blades of knives and forks, which the patentee proposes to accomplish by means of a detached metal bolster. This bolster has a socket of thick metal at one end for the reception of the blade of the knife, &c., and a thin one at the other for the reception of the handle. A solid handle of ivory, horn, wood, or other substance, having been cut and shaped, is bored down the centre, and a deep groove or indent cut round its upper part; the knife blade is then affixed to the socket by soldering or drilling, as may be preferred, and the tang cemented to the handle with resin in the ordinary way; after which the edges of the thin metal socket are to be pressed down into the groove or cavity made to receive them, or over a rim or projection on the handle, so as to hold them firmly together. The bolster is to be so formed as to preserve the "balance" of the handle, and may be of any desired metal.

NOTES AND NOTICES.

Railroad Collisions.—The disastrous effects of collisions of trains might be greatly diminished or altogether prevented, if each train were preceded and followed by a collapsing platform carrying a stack of brushwood fascines or other compressible materials. The momentum of the heaviest and fastest trains would be absorbed (so to speak) in squeezing up these stacks, if they were made of sufficient bulk. We know that even the shot of battering guns may be arrested by such means, and may therefore fairly anticipate that no great difficulty would be found in availing ourselves of this simple method of averting the appalling events which have so frequently occurred of late.

K. H.

The Navigation of the Atlantic by Steam was in 1838 ridiculed as an impossibility; in 1839 it was accomplished; in 1840 vessels steam between Great Britain and the United States as regularly as between London and Leith; and in 1841 it is calculated that there will be 42 steamers, of the total burden of 58,260 tons, employed in this traffic alone. —*Mechanics' Almanack.*

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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SIR GEORGE CAYLEY'S MEANS OF PROMOTING SAFETY IN RAILWAY CARRIAGES.

Fig. 1.

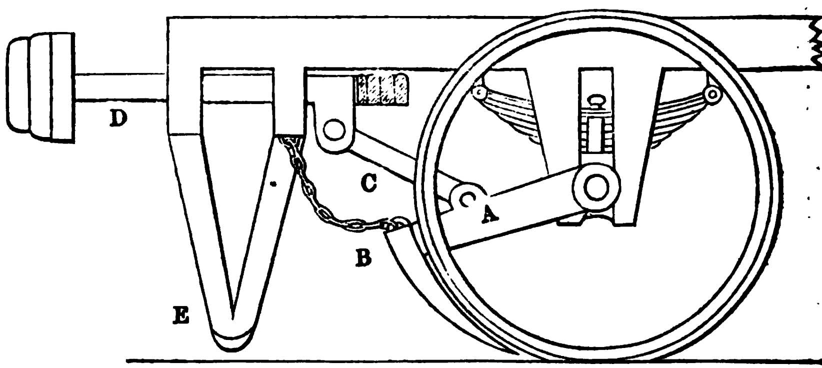
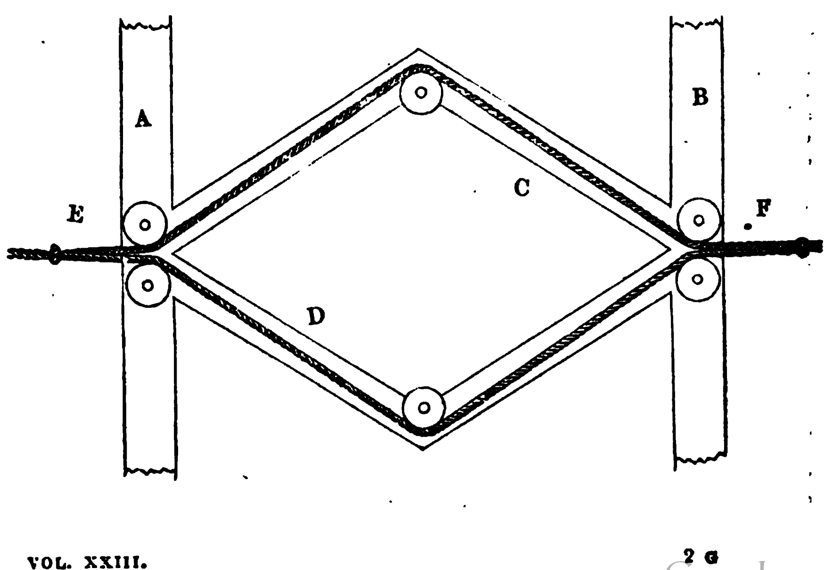


Fig. 2.



ESSAY ON THE MEANS OF PROMOTING SAFETY IN RAILWAY CARRIAGES.

BY SIR GEORGE CAYLEY, BART.

[Continued from page 468.]

It may be thought superfluous to place a general buffer behind the trains; and if *every* train be provided with one in front it would be unnecessary, but engines unattached to anything are frequently moving about, may escape, and with unrestrained velocity run in upon a train at rest. If this be too remote a contingency to deserve notice, the hind buffer may be dispensed with—however agreeable it may be to have two buffers between us and danger in most cases, and certainly one in all. It may be thought, in lieu of the air buffer, which is necessarily of considerable weight, that a series of mattresses being lighter, and of course not absorbing so much engine power to propel them, would be preferable; but it ought also to be considered, that the leading vehicle in a train, in proportion to its lightness is more readily thrown off the rail and thus gives a wider range to accident, which it is our great object to avoid. The pads of the air buffer, as before described, show a flat face, which, upon the whole, I think likely to prove the best form; but they might in front have the form given them of a gothic arch, for the double purpose of obviating the resistance of the air, one of the great impediments to velocity, and the better to cast light objects, or human beings, off the line of the rail with an oblique and less forcible blow: but here again the same objection arises—we are increasing the risk by a side force of driving the buffer carriage off the rail. These are matters deserving of serious inquiry; and which scarcely any thing but practice can finally determine.

When we meet a train coming at full speed on another set of rails, the rush past is really terrific; and conveys an idea that were they to meet on the same rails nothing could save either from destruction. There is quite terror enough in the public mind on the subject of railways; and it is therefore well to make calm estimates of the degree of danger attending even such cases of possible occurrence as this. Paradoxical as at first it may appear, the shock to each train in this case, if of equal weights and velocities, would not be greater than if it had gone against any solid object; for if the elasticity of the buffers be supposed perfect, each train would rebound with the same velocity it advanced; and the retardation at the moment, of each from the other, is just sufficient to furnish the resistance necessary to produce that equivalent rebound.

If equal trains meet, having unequal velocities, say one at ten miles per hour, and the other twenty, they will average the shock between them, the slow train getting more shock than it would against a solid object and the other less.

Heavier trains meeting light ones with the same velocity will communicate the greater share of the shock to the lighter ones—for the momentum of each after the shock will be equal; and of course the velocity of the rebound, which is the cause of danger to passengers, will be greatest in the lighter train.

There is one case truly terrific in the meeting of trains, and that is, if, when on different rails, any very strong portion of one carriage firmly chained to the rest, should, from getting displaced, catch some weaker portion of the other train, the latter would successively give way, and the whole force of both trains be expended in the work of devastation. Fortunately this is a most remote contingency, and may be rendered, by precautions that will be pointed out, almost impossible.

Having taking a cursory view of general train buffers, there is something yet to be considered in a minor way respecting the application of elastic matters to secure safety to passengers.

The padded cushions on all sides of the first class carriages should, in a coarser, but not less efficient way, be extended to all carriages for passengers, for each man's life is equally valuable to himself, and it may easily occur that the better man may be killed in the worst carriage.

It was very properly suggested lately in some of the public papers, that railway carriages should be fitted up for only single rows of passengers, so that no one should sit opposite to another. I have always held this opinion, and feel more confirmed in it than ever, by finding that others agree in it. As the feet of one set might pass under the seats of those in front of them, little space would

be lost by this arrangement when new carriages have to be built. In the mean time, some one has suggested a broad padded belt to be placed in front of each passenger, to retain him in his place in case of accident, and to prevent a collison with each other. How John Bull may relish this sort of straight waistcoat I do not know; but perhaps some modification of it for his own safety may be tolerated.

If single rows of passengers be adopted, a few carriages might also be fitted up on the same principle for night trains, with horizontal berths one above the other, to sleep in, as in packet boats. These would at all times be of important use to invalids and elderly persons, and if well padded on all sides, would be as secure as the nature of the case permits.

There is one point that seems unaccountably to have escaped the notice of railroad engineers—and that is, placing the engines under regulation as to velocity, by the usual mechanical means. The common expanding centrifugal force regulator, for cutting off the steam when the engine is going too quick, is as applicable to railroad purposes as to engines in any other situation. The directors may agree that no trains shall on any pretence be permitted to go at more than a given number of miles per hour; let them set the regulator accordingly, and let it be locked up in a case of which they have the keys; the result would be certain in every case. But where the declivity is such as to cause a greater velocity without engine power, the regulator might be so connected with a lever that when the steam was cut off, it should liberate the catch of a forcible spring break upon the wheels of the engine; a matter which any of our common engineers could contrive if required.

The next subject of serious importance to the safety of railway travelling is to have such a mechanical arrangement as will cut off the free action of the wheels from the moment of receiving any shock; and also to have the power of so doing at any time according to the will of the conductor when he perceives danger at hand. This may be done in several ways, and some drawings for this purpose were prepared by Mr. Worsley and myself last year. I understand the subject is now taken up by Mr. Stephenson, under whose auspices it can scarcely fail to be ripened into practice.

To elucidate the subject, rather than to submit a perfectly matured plan for the purpose:

Let fig. 1 represent the front wheel and end of a railway carriage-frame. On the axle of the wheel let an arm A, terminating in a concentric shoe B, turn freely. Connect this arm by the rod or link C, with the shanks of the buffer D, which is held in its place by the buffer spring E. It will be evident from this arrangement that when the buffer is pressed back, the point of the shoe B, will approach the rail, and if further pressed, the wheel will get upon it and the carriage instantly be on the drag; and this can be made to take place at any required degree of force applied to the buffer.

To get off the drag the carriage must be slightly backed, to which there will be opposed no resistance. The perforation in the arm of this drag to receive the axle must be a little elongated in the direction of its length, so that the wheel, which must not touch the drag when not in action, may by its own weight rest firmly upon it when brought under it. A spring may perhaps be found requisite to regulate this simple process. If the two front wheels be thus converted into sledges whenever any serious resistance occurs to the train, perhaps it may be sufficient; but if required, the hind wheels may undergo the same change, by connecting similar drags applied to them with the front movement. As the front wheels, however, are so readily made available as drags by the involuntary action of the buffers in times of accident, it will probably be best to furnish the hind wheels with a similar apparatus to be put into action at the will of the conductor of the train. A little difficulty arises in conveying the pull of a chain or cord from the place where the conductor stands to the carriages at a distance from him, because the play of the buffers keeps continually altering the distance of the carriages from each other. To obviate this difficulty, let A and B, fig. 2, be the hind part of the frame of one carriage and the front frame of another, between where the buffers keep them asunder. Suppose C D to be a jointed parallelogram framework, so made as to be put on at pleasure by a

couple of bolts, and carrying guide pulleys for the rope or chain E F, which is divided into two portions to follow the form of the frame, and unites again on the other side. By this arrangement, it is plain, that although the jointed parallelogram frame can accommodate its diagonal length to every play of the buffers, still each of its sides continues to be of the same length, and hence the chains that correspond with them will neither shorten or elongate as respects the distance of its two extremes E and F, from the frames A and B, so that a steady tension can be transferred from the conductor throughout all the train, if furnished with these parallelogram frames properly fitted up for retaining the chain or rope in the pulleys; consequently the drags on the hind wheels can by this means be brought to act, at the will of the conductor, in every variety of distance each carriage may chance to be from another, at the time the drags are wanted.

Another great branch of inquiry respecting railroad carriages is how best to secure them from getting off the rails, and many things might perhaps be suggested for an entirely new work, but the main question is, what can be done as things are now arranged? and without some additional means nothing can be done but by precautionary measures on this head. Should the railroad companies by their own power, or by the assistance of Government, not weighing money against life, choose to fill up the interval between the rails, excepting near stations, with masonry well clamped together (or even strong oak sleepers near each wheel, if nothing more can be afforded), great additional security would be gained; and such a wall would be the means of keeping men and cattle out of the path of the carriages. Should a wheel break down or come off, much additional security would also be derived by having four feet to each carriage, one of which is represented at F, fig. 1, which would sustain the carriage like a sledge as soon as the wheel in its vicinity failed, and not cause any friction by touching the rail before its services are required.

(To be continued.)

PLAN FOR PREVENTING RAILWAY CARRIAGES BEING THROWN OFF THE LINE.

Sir,—The recent numerous and fatal railway accidents call loudly for some improvements in the railway system, and increased protection to railway travellers, and I beg to suggest through the medium of your journal (should you think it worthy) a plan for preventing locomotive engines and carriages from running off the rail. My suggestion is this; that between the rails the whole length of the line, there should be laid a wooden rail, say 6 inches wide, and that to the front piece of the framing of the engine, there should be fixed, turning on its centre, an iron wheel with a deep groove in it. This wheel to run directly over the wooden rail, but not touch it, so as to cause no increase of friction. It might be applied to the hind part of the tender, and also to the carriages.

I am, Sir,
Your most obedient servant,
M. B. L.

November, 1840.

IMPROVED RAILWAY CARRIAGE LINKER WITH PERMANENT TAIL-ROPE.

Sir,—Having seen in page 440 of the present volume of the *Mechanics' Magazine*, a description of a linker for railroad carriages, I beg leave to send you a plan which I devised some months since, by which I think the present inconvenient system (adopted on the London and South Western, and I believe on other railroads) of stopping the trains to attach a tail-rope for the purpose of allowing the engine to go on another line might be avoided, as, if the train approached at a moderate speed, there would be time enough to shift the metals between the engine and train without stopping.

Should you think the above worthy an insertion in your Magazine, you will oblige

A CONSTANT READER.

P.S. The above may be attached to the tender or the first carriage of the train.

Southampton, Nov. 17, 1840.

[The contrivance of our correspondent consists in adapting to the "*Linker*," shown at page 440, a small drum upon which the tail-rope is wound; this

drum is kept from turning by a sliding bolt; a prong descends from the foot lever just in front of the bolt head; upon pressing down the lever the carriage is disconnected, and at the same time the bolt withdrawn, leaving the drum free to revolve, and the rope to run out. No provision seems to be made for severing the rope in case of accident, but this might be easily accomplished.—Ed. M M.]

SIEVIER'S PATENT ROPE.

Sir,—Presuming that your readers will feel gratified by an account of Mr. Sievier's newly introduced patent rope, I take great pleasure in laying before you and them the following short notice of it.

Siever's patent wire rope is composed of alternate layers of yarn and wire, platted with exquisite skill, and the angles of the wire so minutely formed, that when strained they become nearly straight lines. This intermixture of materials is so pliable as to work freely over a sheave of the same size as ordinary rope of the same diameter, whilst its compactness can be carried so far as to make it nearly as solid as a bar of iron, without detracting from its flexibility. It is also worthy of particular notice that it leaves little or no indentation on the surface, which the common hemp does to a considerable extent, and as the angles of the wire are so arranged as to prevent the rope from elongating to any serious extent, it will never *kink*, nor require a swivel to relieve the twist or strain to which, for instance, the rope on the Blackwall railroad is liable. This new compound material is capable of unlimited extension, so that a rope of any length may be produced without splicing, thereby guaranteeing an uniformity of consistency and strength.

The results of experiments tried in H. M. Dock-yard, Deptford, was as follows:—

	Tons.	Cwt.		
$5\frac{3}{4}$ best white hemp broke at	12	13		
$5\frac{5}{8}$ ditto ditto tarred at	9	8		
	T.	C.	Q.	lbs.
Patent wire rope $4\frac{3}{8}$ broke at	15	18	2	12

showing the relative strength as follows:

Best white rope	10,800
Ditto, tarred	9,309—8
Patent wire rope	19,925

The rope thus tested was composed of three coatings of wire and two coatings of hemp.

I ought to mention further, as a recommendatory feature, that in all cases of wear and tear, whether from age or when cut through by accident or design, the outer coat can be removed and a new metallic covering supplied, whereby the old rope is equivalent to a new one, and this is effected at a trifling expense and trouble.

Upon the whole the new rope appears to be constructed on the most accurate principles, and is evidently the production of a mind perfectly cognizant of all the properties required. Its capabilities are coextensive with its utility, for when strength, flexibility, and compactness are combined, the acme of perfection in rope making has been undoubtedly obtained. Simply considered as a specimen of the arts, it is singularly beautiful and attractive; adapted, however, to the minutest as well as the most stupendous machinery, its importance can hardly be overrated.

I am not aware whether this manufacture is sufficiently advanced to have become an article of commerce, but its use is too important to the whole engineering community to remain long inactive.

I am, Sir,
Your obedient servant,
Nauticus.

Tottenham, Nov. 10, 1840.

DURABILITY OF BLACK AND WHITE PAINT.

Sir,—Permit me to make a few remarks in reply to your correspondent's observations on the seeming contradiction of two writers respecting the use of black and white paint for outside woodwork. It is a subject to which I have long paid great attention, and, from observation, I can safely state that both parties are right, although so opposite to each other. Black paint being made of lamp black, which is a pure kind of charcoal, may almost be said to be indestructible—the elements seem to have little or no effect on it; in proof of this, let any one notice a direction post placed at a corner where two roads meet, and if it has not been painted for a number of years, he will find that the white paint which formed the groundwork has completely perished, while the black which

constituted the letters, remains in a good state of preservation; indeed this is frequently so much the case, that the letters are actually left in relief, owing to the softer parts of the deal having been destroyed by the sun and rain, after the white paint has been carried away by the same powerful influence. On the contrary, if a board has been painted black, and written with white letters, the letters will in a few years disappear, but the groundwork remain unaltered, fully proving that white lead is far less durable than lamp black.

Now then for the disadvantages. As it is well known that all black bodies absorb heat, while white ones reflect it, so we find that doors, shutters, &c., if painted black, shrink and crack much more than white ones, and the paint is more liable to blister; this will readily account for ships requiring more repairs if painted black than they otherwise would do. From hence I think we may come to the following conclusions:—First, that woodwork which is framed together, and consequently liable to injury from shrinking, should never be painted black on the side exposed to the south. Secondly, that black is the most durable colour, and may with safety be used for a northern aspect, or for any boards that are not confined, but have sufficient room allowed for shrinking and swelling.

Should you deem these observations worthy a place in your journal, the insertion will oblige

Your obedient servant,

R. N.

Hitchin, Herts, Dec. 14th, 1840.

PRESERVATIVE PROPERTY OF SULPHATE OF COPPER.

Sir,—With reference to the Paper by Mr. T. B. Hartley, "On the Effects of the Worm on Kyanized Timber exposed to the Action of Sea Water," in No. 903 of your valuable Magazine, it appears, that timber so prepared, and employed in the construction of the Entrance Gates of the Liverpool Docks, was found unequal to resist the attacks of the Teredo Navalis; English elm, however, steeped in a strong solution of sulphate of copper from the Parys copper mines in Anglesea, was found, after three years immersion, to be very slightly injured; while unprepared timber, as well as Kyan's, similarly situated, were quite destroyed. I was not before aware that the sulphate of copper had been employed for such objects; but had noticed its valuable property of preserving timber from decay in the copper mines of Cornwall; in certain situations of the lively and old workings, where it had for many years been exposed, both to the influence of the atmosphere, and to the vitriolic waters constantly percolating through the "Attal," or waste materials supported by the timber. Some importance may be attached to the above circumstance, inasmuch as these accumulations must inevitably have given way in the lapse of time, and choked up the channels of ventilation, had the timber decayed.

In the lead mines of Derbyshire, on the contrary, where this fluid is wanting, I remarked that timber employed for like purposes, was more or less decayed, and that the descent by the rude ladders, to the workings, was extremely dangerous on account of the decay of the ends of the rungs, or trundles, inserted in the rocks.

Now, as these mineral waters abound in Cornwall, in Anglesea, and indeed in all situations where copper is to be found, it appears to me, that a comparison in such localities, of timber so saturated, with that prepared after Kyan's process, and used, for example, as railway bearers, paling, &c., would be well worth the trial; as it might possibly lead to the profitable employment of a fluid, which now, for the most part, is allowed to run to waste.

I am, Sir, your most obedient servant,

NAUTICUS.

Woolwich, Dec. 4, 1840.

NEW DESCRIPTION OF CONCRETE FOR THE FORMATION OF ROADS AND STREETS.

Sir,—Allow me through the medium of the *Mechanics' Magazine*, to solicit the attention of that part of the public who are interested in the construction of roads and pavements to the following remarks on that important subject.

After the various plans which have been adopted and the immense sums that have been expended in the metro-

polis and other places for the accomplishment of that desirable object, namely, a durable and economical pavement, I am prompted by the flattering testimonials I have received and the advice of my friends to make a public announcement of my plan of road making.

I have long been convinced that if a method could be discovered to cement the materials used in making roads instead of the dirt and sand which is thought necessary, it would be very desirable.

I believe it is well understood that neither gravel nor granite stone will set without a portion of dirt and a certain quantity of water. I say a certain quantity of water, because if there be either too much or too little, it is well known that the dirt which cements the material is not in a proper condition, and even when it becomes solid, it still requires a certain quantity of water to keep it so, or else, in very dry weather, turns to dust, and after rain becomes almost liquid or like a thick batter.

The pressure of the traffic forces the mud to the surface, which stiffens by exposure to the air, and soon becomes a thick coating of dirt. Now this will continue so long as it remains wet, because just as deep as the wet has penetrated the whole material of the road will be in motion. I have known roads that have been laid ten or twelve inches thick with material taken up again in a few years, when, in order to get out all the material that was first used, it has been found necessary to go to the depth of at least two feet, its motion having extended to that depth. It is neither on the gravel nor on the stone that the weather acts so powerfully, but on the dirt by which they are cemented; for it is well known that gravel lying in a river or stone in a watery quarry, is quite as hard as when taken out and dried.

To remedy these evils I have devoted much time and attention, and after many trials of materials of various kinds I have ascertained that coal or gas tar in its raw state, being a resinous substance and not acted upon by water or air when mixed with other materials in proper proportions—then mixed with the granite or broken stone as a substitute for dirt or sand and applied in the manner I have discovered—is most decidedly an excellent and economical concrete for the formation of streets and roads. To prove that such is the case, I refer to the south entrance into the town of Nottingham, certain portions of which have been formed upon the above plan, and after twelve months trial it is now a very superior piece of road, not affected either by frost or by any change in the atmosphere. I have also received directions to take up several streets and reform them upon my plan, which is a practical demonstration of its utility.

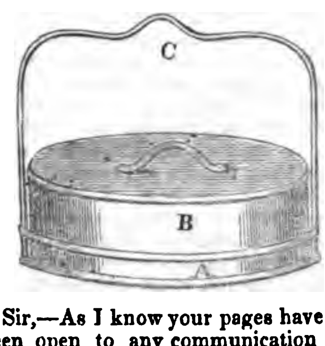
The composition is equally applicable to a variety of other purposes such as *gentlemen's carriage-roads, foot-paths, garden-paths, court-yards, stack-yards, manure-yards, barn-floors, stable-yards*, &c., and, indeed, any situation where a clean and smooth surface is required.

I am, Sir,
Your obedient servant,
THOMAS SMART.

Nottingham, December 8, 1840.

P.S.—I will just add, that I have carefully watched, in all weathers, the roads I have made in the manner above stated, and am fully convinced of their superiority even over roads formed with wood, in affording a safe footing for horses, which is not the case with wood pavements in wet weather.

AN ECONOMICAL DOMESTIC OVEN.



Sir,—As I know your pages have ever been open to any communication that might contribute to the information, or advantage of the working classes of your readers, as well as those upon the higher branches of science, I trust you will favour me with a small space for a description of a small economical domestic oven which I have been using for several years, and have found exceedingly useful and convenient. I am one of the

working classes, and live at a distance from my manufactory. I dine in my warehouse every day, and have found it contribute to my comfort in giving me a hot dinner whenever I wish it. I am persuaded that many others who are similarly situated, as well as every poor family, who have not always the common conveniences of cooking at home, would find this a very useful article, and the price inconsiderable. Indeed, there are many working men in this and other manufacturing towns who could make one for themselves, as little more than a piece of sheet iron is necessary. The bare inspection of the drawing above will show its construction. A is the bottom, 1¼ inch deep, and 11 inches diameter. B is the cover, 4½ inches deep, and fits easy within the bottom, but close and even round the edge, to keep out the smoke. C is the handle, sufficiently high to admit the cover to be taken out and put in with convenience; and there is a moveable small hoop of sheet iron, about 5 inches diameter and ¾ of an inch deep to put the dish upon, and keep it from the bottom to prevent burning. These are the dimensions of my oven, and it cost me three shillings.

The top should not be more than 4½ inches, or 5 inches deep, as this keeps the hot air close upon the meat, and makes it brown in roasting.

One of the principle advantages of this oven is, that it requires no additional fire to use it; when you have put your meat in it, hang it over a common fire, which will rarely require even stirring, to roast it. A little experience will teach how to regulate the distance it should hang from the fire to prevent burning, or increase the heat. I have cooked beef-steaks and mutton-chops, a pigeon, a rabbit, a small pudding and pie, sausages, fish of various sorts, not too large; every thing too, clean and nicely done; and it roasts potatoes to admiration. All that is necessary to keep it in order is to have it well washed and made clean every time it is used.

I am, Sir, respectfully,
Your obedient servant,
DEMOPHILUS.

Birmingham, Nov. 19, 1840.

SECOND PROOF OF PROPOSITION XXIX, BOOK I OF EUCLID, INDEPENDENTLY OF AXIOM XII.*

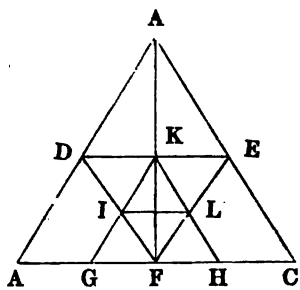
Sir,—The corollaries to Proposition B (which follows) will render obvious my reason for choosing the isosceles, in preference to the equilateral, triangle. It will be seen that from the former, the proof of the equality of the three angles of any triangle to two right angles is directly deduced, without the intervention of subsidiary propositions.

NAUTILUS.

8th December, 1840.

Prop. B. Theor.

The straight lines, joining the points of bisection in the sides and base of an isosceles triangle, divide it into four interior triangles, any one of which is equal to another.



Let A B C be an isosceles triangle, bisected on the sides and base at the points D E F; join D E, D F, E F. The triangles D A E, D F E, B D F, C E F, are equal and similar.

Join A F, and because A F is drawn through the vertex, and bisects the base, of an isosceles triangle; it is perpendicular to the base, and bisects the vertex (8th of 1st). A F also bisects D E, and is at right angles with it, because A F bisects the vertex of the isosceles D A E, whereof D E is the base; the triangle D F E is isosceles by Prop. A.

Bisect D F, E F, in I and L; join K I, K L; and because the triangles D I K, K L E are equal (Prop. A.), so also are the angles D K I, E K L; therefore the intervening angle, I K L, is bisected by the perpendicular A F. Join I L, and

* This is the additional proposition promised by our ingenious correspondent "Nautilus" in his last communication (No. 905, p. 557), which ought to have been dated 6th November. ED. M. M.

because I L joins the points of bisection in the equal sides of the isosceles D F E, therefore it is at right angles with, and bisects, its perpendicular K F (Cor. to Prop. A.) Produce K I, K L to meet the base B C in G and H; then because in the two triangles G K F, H K F the angles at K are equal by bisection; the angles at F, right angles; and the side K F common to both; therefore K H is equal to K G (26th of 1st), and G K H is an isosceles triangle, whereof F K is the perpendicular; but F K is at right angles with, and is bisected by, I L: therefore I L bisects the sides K G, K H of the isosceles G K H. (Cor. to Prop. A.)

Because I is in the bisection of K G, K I is equal to I G; and because I is also in the bisection of D F, D I is equal to I F; but the angles at I are equal and vertical, therefore the triangles D I K, G I F, are equal, and also their bases D K and G F: and since the triangle G I F is isosceles (Prop. A.), its side I G must terminate in the bisection of B F, because I G is equal to I F, and is drawn from the bisection of the side D F of the isosceles B D F, whereof B F is the base; and there cannot be more than one straight line drawn from the point I, terminating in B F, which shall be equal to I F.

Therefore G F being the bisection of B F, and D K that of D E—B F, D E are equal to one another, and also to F C. Hence the bases of the four triangles D A E, D F E, B D F, F E C, being equal, and also their sides equal (by Prop. A.), the triangles themselves are equal.

Wherefore the straight lines, joining, &c.

Q. E. D.

Cor. 1st. The three angles of any *isosceles* triangle are together equal to two right angles.

Cor. 2nd. Since any right angled triangle may be made the half of an isosceles triangle, therefore the three angles of any right angled triangle are equal to two right angles.

Cor. 3rd. Since *any* triangle may be divided into two right angled triangles, therefore the three angles of any triangle are together equal to two right angles.

LAW OF THE EXPANSION OF AIR.

Sir,—A correspondent in No. 903, p. 499, of the *Mech. Mag.*, asks the law of expansion of air when heated.

According to the best observations, those of Rudberg—dry air, or any dry gas, under a given pressure, expands when heated according to the following law:—

$$\frac{\text{Volume at } T^{\circ} \text{ centigrade}}{\text{Volume at } O^{\circ} \text{ centigrade}} = 1 + (0.003646)\,T.$$

See "Poggendorff's Annalen," vol. 41. Tables for facilitating the computation of the volume of air at a given temperature will be found in "Poggendorff's Annalen," vol. 41, p. 449, and in the 4th edition of H. Rose's "Analytical Chemistry," vol. 2, p. 740.

M. H. W.

THERMO-BAROMETER.

Sir,—It is probably familiar to many of your readers, that a new apparatus under this name is to be found at most opticians, &c., for sale, but not being able to obtain a satisfactory explanation of the principles on which it is constructed, I beg to solicit the same from some of your well-informed correspondents.

I may mention that it consists of—1st, a thermometer; 2nd, a short bent tube, open above, and ending below in a bulb containing air,* which rests above the mercury that occupies the greater part of the tube.

Attached to the longer leg of the tube are two scales, of which one is fixed and graduated as a thermometer, the other sliding and marked in inches and 10ths, as for a barometer.

In using the instrument, 29½ inches on the moveable scale is brought to the level of the mercury in the bent tube, and the index of a vernier, which slides on *the moveable scale*, being brought to a point on the *fixed scale* corresponding to that indicated by the attached thermometer, gives the atmospheric pressure to 100ths of an inch.

I am desirous of ascertaining the principle on which the instrument is constructed, the chief apparent difficulty being as to the graduation of the *fixed* scale of temperature.

But there is a further difficulty in the fact that some instruments, apparently of the same construction, have the ba-

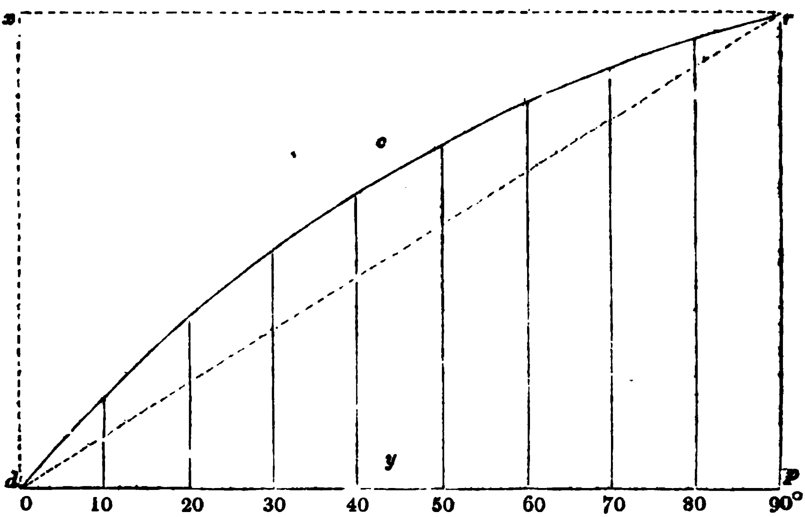
rometric scale of inches running from *above*, downwards, instead of from *below*, upwards, as described.

I may mention that the instrument appears perfectly trustworthy for ordinary purposes, and, besides its convenient portability (about 8 inches by 3), forms an ornament to the drawing-room or library table.

I am, Sir, your obedient servant,
A CONSTANT READER.

Bath, Oct. 12th, 1840.

MODE OF ESTIMATING THE POWER OF THE CRANK IN STEAM ENGINES.



Sir,—It appears to me on referring to some of the numerous communications in your valuable Magazine, concerning the loss of power occasioned by the use of the crank of the steam engine, that the mean power of the engine has been underrated, in one or two of these statements, even as low as one-half. The reason of this I will endeavour to explain. The method I shall adopt is to suppose a given line to represent a certain amount of power, and if put in motion to generate a space, which space will conveniently serve to represent the amount of work performed by the said power. As follows: Suppose the line *r p* to represent the full power of the engine, and the line *p d* to represent the circumference, or 90° of the revolution of the crank laid down in a straight line. The object of this is, that the sines of equal arcs may stand on the line *p d*, as ordinates at equal distances from each other. By this arrangement, the mean power of the engine can be obtained with the greatest facility. Now it is evident, if the line *r p* be supposed to move to *d* (which represents the dead point,) without any decrease in its length during the course of its motion, it will generate the parallelogram *r p d x*, which will serve to represent the amount of work done, the power remaining constant. *Secondly*, if the line *r p*, in moving from *r p* to *d*, be supposed to decrease in an equal ratio till it vanishes at *d*, it would generate the triangle *p y d r*, which would be half of the parallelogram *r p d x*; consequently, the amount of work done would be equal to half of what was done in the former case. But the case is different with the steam engine. The leverage of the crank at any particular position is to the power of the engine, as the right sine of the angle made by the crank and connecting rod, is to the radius of the crank: consequently, the leverage will decrease in the same ratio

as the sines. Suppose the line $r\,p$ to be put in motion, and to decrease in the same ratio as the sines of the angles, then will the upper extremity r, in moving to d, generate the curve $r\,c\,d$, which curve is termed the curve of sines, and the line $r\ p$ will generate the curved area d, c, r, p, y, d, which will exactly represent the amount of work done, and this area is equal to the square of the radius $r\ p$, or equal to .6366 of what it would have been had it been working uniformly at the full power $r\,p$. Now it will appear plain why the mean power of the engine has been understood by the method usually adopted, which is to take the amount of the sines of the angles corresponding to a given number of positions, and to divide that amount by the number of positions; but this will give the mean amount, on the supposition that the engine is at work at those particular positions only. As it is evident, however, that the engine is continuing to produce power while the crank is moving from any of these positions to the next adjoining, this method cannot give the total amount of mean power. The sines of the angles of ⅓ds. of the quadrant, viz. from 60° to 90° will all be greater than one-half of the radius; consequently, the greater number of positions taken, the greater will be the result of mean power by this method. Now the method made use of in the former part of this statement, does not admit of any loss of power whatever. The line $r\,p$ in the course of its motion to d, passes through every part of the curve, and successively representing the sines of all the corresponding angles of the crank, the space generated by the motion of the line $r\,p$, will give the full amount of mean power, which will be equal to that which would have been produced by taking an infinite number of positions,—viz. .6366 as before, which corresponds with the amount given in two or three of the communications in your Magazine. This result exactly agrees with the well known law, that the power is inversely as the space passed over. In the present case as the motion of the piston is to the motion of the crank,—viz. .6366. The argument in the foregoing statement is founded on the supposition that the connecting rod is infinite in length; the result will not be affected by its length. With a shorter connecting rod the power will be more unequally divided. The two points at which the crank and connecting rod are at right angles will be nearer to the cylinder, thereby dividing the whole revolution of the crank into two unequal parts. In that part which is furthest from the cylinder, the angles of the crank and connecting rod will differ more from a right angle, but this will be fully compensated by the nearer approach to a right angle in the other part which is nearest the cylinder.

If the operation be reversed, by applying to the crank an uniform power which may be represented by the decimal .6366, it will communicate to the piston a mean power equal to 1, which exactly agrees with the aforesaid law. To find the power of the engine at any particular position of the crank, multiply the sine of the angle of the crank and connecting rod by the cosine of the angle of the connecting rod axis of the cylinder.

The insertion of the foregoing in your useful Magazine, will much oblige your humble servant,

J. R. Aris.

60, King-street, Stepney, Nov. 9, 1840.

PLAN FOR WORKING THE SLIDING VALVES OF LOCOMOTIVE ENGINES WITH ONLY TWO FIXED ECCENTRICS.

Sir,—A plan has long been desired for working the sliding valves of a locomotive engine with two fixed eccentrics (that is one to each cylinder) so as to give the lead correctly when the motion of the engine is reversed, that is to say, when the engine is working either way. There have long since been locomotive engines constructed with only two eccentrics,and so as to give the required lead to the valves when working in either direction; but these eccentrics used to be made to work loose upon the shaft, and when the motion of the engine was required to be changed, their situations were altered by means of levers and catches. But before the catches could get to their proper places, the shaft was obliged to be turned, nearly half way round at least; therefore, each engine was furnished with a set of rods and levers to enable the engineman to work each valve by hand until the shaft came to the proper place for the catches to go together. This plan, in consequence of

the tediousness in reversing the motion, its being so very liable to get out of repair, and other objections, has nearly fallen into disuse.

The plan now almost universally adopted, consists of four eccentrics, all of which are firmly fixed to the shaft. These eccentrics are so arranged, that two of them work the valves when the engine is going in the forward direction, and the other two work the valves when the engine is going in the backward direction. The four eccentric rods are all connected to one main lever, namely the reversing lever, and by this lever two of the eccentric rod-ends may be attached to, at the same time the other two will be detached from, the levers which work the valves. With this arrangement the starting, and reversing of the engine, are so simple as to be performed by the greatest stranger; while with the former, the engineman requires considerable practice before he can get properly into the way of starting and reversing.

A plan for reversing the motion of the engine with greater ease, and for giving the lead to the valves with greater accuracy, than that with the four eccentrics, can hardly be desired, but it has long been the study of many ingenious persons, to contrive a method from which they may obtain exactly the same result with *two fixed eccentrics*. This subject has, to my knowledge, been the cause of many experiments, some of which have, by accident, arrived pretty near to the point of correctness; but on their being performed upon a large scale, in consequence of the persons engaged in them, not being thoroughly acquainted with their ruling principles, they have been deemed incorrect. There are those who have studied this subject so minutely, and made so many unsuccessful experiments, as at last to conclude it impossible to obtain this result in the manner alluded to. I have seen several ingenious diagrams, intended to prove the impossibility, and I have even known attempts made to prove it impossible by geometrical demonstration.

I think it needless for me to enter into the details of the valve work; however, I will give a short description of the method of setting the four eccentrics, which will refresh the memory of the reader with their principles, and at the same time, perhaps, serve for as good proof of the plan I am about to describe as can readily be given.

As the eccentrics, and all the other parts of the valve work, belonging to the one cylinder are generally the same as, but quite independent of, those belonging to the other cylinder, and as each pair of eccentrics require to be set at exactly the same angles with their respective cranks, I think it will render the explanation much plainer to only take into consideration the two eccentrics belonging to one cylinder, namely, one for the forward and the other for the backward motion.

Suppose A B C D, fig. 1, to be the circle described by the crank, *a* the lever to which the eccentric rods are to be attached, E C a line drawn through the centres of the cylinder, the end of the lever, and the crank-axle; and B D another line also drawn through the centre of the crank-axle, but perpendicular to E C. Suppose the crank to be at C. Now when the crank is in this situation the piston will, of course, be at the end of the cylinder, and the lead is generally considered as the distance the valve has moved from the middle of its stroke, or as the distance it is open, when the piston is in this situation. To give this lead, when the engine is working in the direction shown by the arrow F, the eccentric must be set about *c*, and the perpendicular distance from the line B D to *c*, is the quantity of lead in the eccentric. Now when the rod belonging to *c*, namely, the eccentric rod, is attached to *a*, the valve will have the lead for working the engine in the direction shown by F, and it will continue to open until the crank arrives at G. But if the crank be turned in the direction shown at H, the eccentric will cause the valve to move in the wrong direction, and, consequently, allow the steam to act contrary to the motion of the piston. Therefore another eccentric *e* is furnished, which is set at exactly the same angle with the crank as *c*, but on the opposite side. Both of the eccentric-rod ends are connected to the reversing lever, as I before observed, by which they may be attached to, and detached from, the lever *a* at pleasure. It will be seen, by attention to the drawing, that the changing of the eccentric rods, when the crank is at C, will produce no alteration in the position of the valve; neither is it neces-

sary it should, because the piston is then at the end of its stroke, and although the crank be required to turn in the other direction, the steam will still be required to act upon the same side of the piston.

Let us now suppose the crank to be at B; the eccentrics will now be at *f*, *g*, and the piston about the middle of the cylinder. When the engine is intended to work in the direction of F, the rod belonging to *f*, must be attached to the

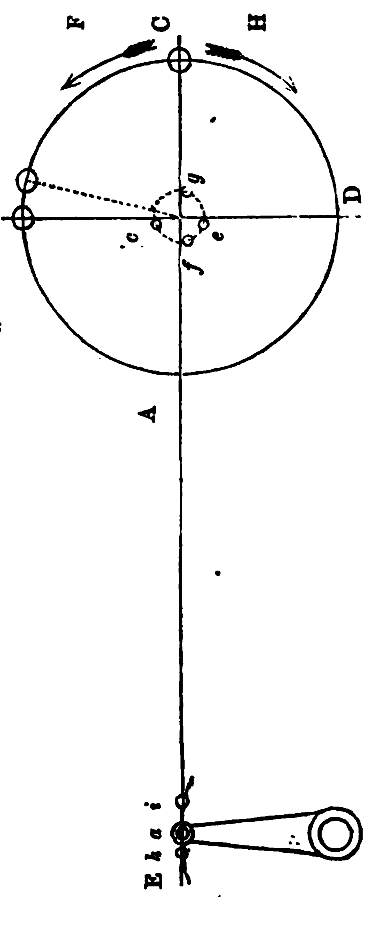


Fig. 1.

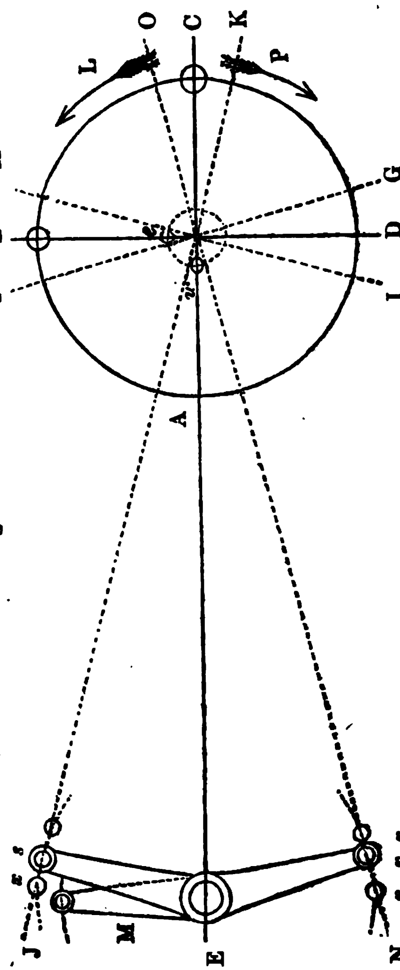


Fig. 2.

lever, which will cause it to stand at *h*, and consequently the valve will be wide open, with the exception of the little difference caused by the lead. To reverse the motion, that is to say, to set the valve for working the engine in the other direction, the valve must be made to slide, so as to open to the same extent, to allow the steam to act upon the contrary side of the piston. This is accomplished by the reversing lever which detaches the rod belonging to *f*, and at-

: ı es that belonging to *g*, which, by means of its forked end, draws the lever points to *i*, and consequently, causes the steam to act upon the other side of, and force back, the piston.

By a little attention, it may be seen that, while the crank is in any point of its revolution, the changing of the eccentric rods will produce that alteration in the position of the valve required to reverse the motion of the engine. Therefore, I think the two points, in which we have supposed the crank, will be sufficient to explain the manner in which the lead is effected, and the motion reversed, by the two fixed eccentrics to each valve.

I shall now proceed to explain the principles of a plan for giving the lead to the valves, and reversing the motion of a locomotive engine with *two fixed* eccentrics instead of four. In the following explanation, for the same reason as in the foregoing, I shall only speak of the valve, &c. belonging to one cylinder.

Suppose (as in fig. 1.) the circle A B C D, fig. 2, to be described by the crank; E C, a line drawn through the centres of the cylinder and crank axle; and B D, to be drawn perpendicular to E C. Suppose the crank to be at C, and the eccentric at *e*. After having determined the quantity of lead to be given by the eccentric, draw the lines F G, H I, at the same angles with the crank, as you would set the eccentrics in fig. 1, to give the same quantity of lead. Then draw the line J K perpendicular to H I, and that end of the lever to which the eccentric rod is attached when the engine is working in the direction of L, must come in this line, supposing the valve to be worked by the lever M. By a little attention it will be perceived, that by setting the end of the lever in this situation, the valve will have the same quantity of lead, as it would if the lever and eccentric were set as in fig. 1. To cause the engine to be right for working in the contrary direction, no alteration is necessary in the situation of the valve; still it would not do to let the eccentric rod remain attached to *s*. Therefore, I introduce another lever *v*, the end of which comes in the line N O, which is drawn perpendicular to F G, and, by means of the reversing lever, I detach the eccentric rod from *s*, and attach it to *v*, which will still allow the valve to have the lead, and also cause it to move in the proper direction when the engine is working in the direction of P.

Let us now turn the crank to B. The eccentric will now stand at *w*. To cause the piston to work the crank in the direction of L, the eccentric rod end must be attached to *s*, as before, which will cause it to stand at *x*, and consequently cause the valve to be wide open, with the exception of the little variation caused by the lead, as I spoke of in fig. 1. To reverse the motion, that is, to cause the crank to turn in the direction of P, I remove the eccentric rod end from *x* to *r*, and by this means (the eccentric end being properly formed,) the lever will be drawn from *o* to *n*; consequently the valve will receive the same change as it did in fig. 1, by changing the eccentric rods when the crank was B.

By setting the cranks in figs. 1 and 2, in any two corresponding points of their revolutions, it will be found that, when the eccentric rod, fig. 2, is attached to the lever *s*, the valve will be in the same situation, as that, of fig. 2, when the rod belonging to *c*, is attached to the lever *a*. And it will also be found that the change of the eccentric rods in fig. 1, will effect the same change in the situation of the valve, as the removing of the eccentric rod, fig. 2, from the one lever to the other. Hence, it is evident, that one eccentric, with the two levers arranged in the manner described, will produce the same effect upon the valve in every respect, as is now produced by the two eccentrics.

The distance *s v*, fig. 2, will depend upon the length of the eccentric rod, and the quantity of lead in the eccentric. If the eccentric *b c* required to give a greater quantity of lead than common, it will, perhaps, cause the levers *s v*, to be of an inconvenient length; therefore, it will perhaps be advisable to use two bell crank levers instead. But these particulars are of little importance; the principal thing to be attended to, is to set the ends of these two levers in the proper places.

I am afraid I am trespassing too far upon your pages; therefore, I will conclude with a short explanation of a little deviation in this latter arrangement from the former, which, before I did not think worthy of notice. When the crank is at C, fig. 1, either of the eccen-

tric rods may be attached to the lever *a*, without moving it. But in fig. 2, when the crank is in that same position, it will be found that the eccentric rod cannot be removed from *s* to *v* without making a little alteration in the levers. It would be a waste of time to enter into minute explanation of this little alteration, which is produced by the vibration of that end of the eccentric rod in connection with the eccentric—upon the same principle as the piston is caused not to be in the middle of the cylinder when the crank is at B.

I remain, Sir,

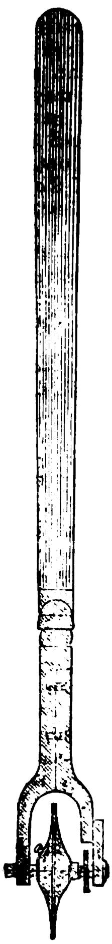
Yours very respectfully,

JOHN CHARLES PEARCE.

Leeds, Nov. 10, 1840.

IMPROVED DOTTING PEN.

Fig. 1.



2

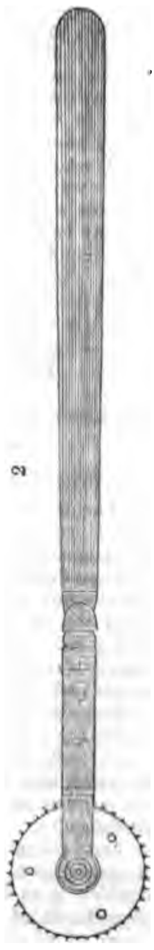
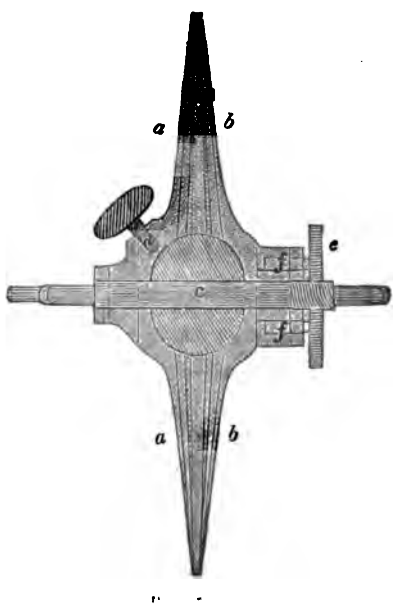


Fig. 3.



Sir, I have sketched out roughly in the accompanying drawings an idea which has occurred to me in connection with the making of dotted lines. There is not to my knowledge any instrument which even passably accomplishes the

above object, and therefore any attempt to supply what must on all hands be admitted to be a desideratum, cannot but be received with candour. Before explaining it, I will say, that I have not yet gone to the expense of having one made, but should there be no practical difficulties suggested by any of your correspondents, I shall certainly get one made for my own usé.

In fig. 1 and 2 the instrument is represented of the usual size; in fig. 3 is shown a sectional view of the dotter, with observations, &c. four times the real size, for the sake of better explanation. In the larger sketch it will be seen that the dotter is composed of two thin plates, *a* and *b*, somewhat similar to a pair of cymbals; *a* is fixed to the arbor *c*; but *b*, though so attached to the arbor that it will revolve with it, is yet allowed to move to and from the other plate *a*. This movement is accomplished by means of the nut *e*, which has two prongs, *f f*, projecting from it, and working in a circular groove in the plate *b*: so that when the nut is screwed backwards or forwards, the plate *b* must of course follow, and thus the thickness of the dotted line may be regulated with great exactness, the ink is put in at *d*.

I think enough has been said to render the sketch perfectly plain. I therefore leave it to the courtesy of your readers, and remain, Sir,

Your most obedient servant,

T. C.

Manchester, December 3, 1840.

PRACTICAL HINTS IN PLASTER CASTING.

Sir,—Having acquired some time back a little experience on the subject of "J. R.'s" inquiry (in your last Number) the following may, perhaps, be useful to him.

In casting from a plaster its face must be covered with a substance that will prevent the liquid plaster from adhering when set, pipe clay is generally used and can be applied with a camel-hair brush, which may be worked against a piece of the clay with some water into a kind of lather and brushed over the surface, or a strong soap lather may be used in the same way. When the mould has set it may be separated from the original by immersing them in water until saturated, when they will easily come apart. I do not know that there is any method by which you can ensure your original from being discoloured; but by using white soap you may come very near to such condition.

In mixing the plaster it should be thrown into the water by spoonfuls and allowed to fall to the bottom before you add more, as it may otherwise become lumpy; nor should it be stirred more than necessary.

To make the mould, a portion of plaster should be put quite fluid upon the original and spread over its surface with a soft brush, by which means you remove the air-bubbles and work the plaster into the finer parts, you can then fill up to any thickness you may require.

To cast in wax, plaster moulds are used; they should be placed in warm water until saturated, taken out, and the superfluous water blown off the face by the lungs, or a pair of bellows; or the moulds may be wrapped in a dry cloth for a few seconds; the wax is then to be poured in. Care must be taken that the mould be not too dry, as the wax would be sure to tear out pieces of the plaster.

I remain, Sir,

Your obedient servant,

W. I. Miers.

111, Strand, November 26, 1840.

INSTRUCTIONS FOR PLASTER CASTING.

Sir,—The art of copying in plaster is one of great convenience and admits of a most extensive application; it is one, however, that depends greatly for its successful execution upon the skill and ingenuity of the operator. The mode of proceeding must in all cases be adapted to the particular object in view, and little beyond general directions can be given for the purpose. I trust, however, that your inquiring correspondent, "J. R.," (page 491) will find the following remarks useful, and that they may serve in some measure to relieve him from his present difficulty.

The first preparatory step towards plaster casting, is to form a mould of the article which is to be copied; there are several methods of accomplishing this, the choice of which must be regulated by the material, form, &c., of the original. The best materials for taking mould impressions from plaster originals,

as well as from coins and medals, is a mixture of sulphur and red-lead in equal proportions (by weight); the sulphur being melted, the red lead is to be stirred in, and the two ingredients well incorporated together. Some persons prefer a smaller proportion of red lead, while others dispense with it altogether, using sulphur alone; but they are much better combined, as such moulds retain an exquisite sharpness, and are very durable. In the case of silver coins, &c. the sulphur mould must not be used, as it would tarnish and injure them, For such purposes, a composition of bees'-wax, pitch and resin may be used with advantage; or the mould itself may be formed of fine plaster, subsequently hardened with linseed oil. For temporary purposes, wax alone may be employed.

Whatever material is used, the mode of proceeding is nearly as follows:—the coin, medal, or original, is to be oiled all over with a soft camel's-hair pencil or cotton wool dipped in olive oil, taking care that the oil does not remain in any quantity in the hollows; a strip of strong paper, about an inch and a half wide, is to be wound round the edge of the medal, in the form of a cylinder of which the medal forms the base. The melted sulphur or other composition for the mould, is to be poured upon the medal, and when cold may be readily separated from it. The moulds thus obtained, are to be surrounded with a paper cylinder and oiled, as before directed; plaster of paris is to be smoothly mixed with water to the consistence of thick cream *(not Devonshire clouted cream)* and poured into the paper well. If the article to be copied contains much work, with many fine lines, it is well to pour on a small quantity of the plaster first and urge it into the cavities with a brush, afterwards adding plaster enough to give the thickness required. A very beautiful effect is sometimes obtained by taking a first thin cast of the relieved parts, in plaster which has been mixed with some coloured water, as blue, red, green, &c., subsequently adding the pure white plaster to form the table and substance of the medallion. Of course the converse method may also be adopted, giving a white profile on a coloured table.

The foregoing operations relate entirely to comparatively flat objects, which are by far the most manageable and may be executed with an ordinary share of dexterity: but when the objects consist of busts, figures, &c., in bas-relief, the manipulation becomes more difficult. In that case a different course must be adopted, and various contingencies provided for, requiring a degree of skill only to be acquired by practice, and not to be communicated in any printed directions. In some instances, by filling up the under-cuttings with wax or tallow, a mould may be taken in the manner before stated, in a single piece; the under-cuttings being afterwards worked out by proper tools, in each casting. Other subjects may render it necessary to form the mould of plaster and divide it into two, three, or a greater number of pieces.

About eight or ten years ago, an ingenious Italian artist exhibited and taught a method of making *elastic moulds*, by means of which he produced some of the most beautiful plaster castings I ever saw, many of them from subjects of more than ordinary difficulty. One was a hand grasping an orange—another a bunch of filberts—from a single mould; but his *chef d'œuvre* was a clenched hand holding a live eel, the convolutions of which, issuing from between the fingers, formed a series of loops that seemed to defy all attempts to perpetuate their appearance by casting. Serpents, lizards, and other small animals upon slabs, may be copied by single moulds of this description very easily; while many bas-reliefs that would require plaster moulds to be divided into a great number of pieces, may, by means of the elastic moulds, be accomplished with two or three divisions.

To make these moulds, take one part (by weight) of the best glue and two parts of treacle; the glue having been softened in water, is to be melted and the treacle added to it. These ingredients should be intimately incorporated together, which is best accomplished by pouring the composition into a tray to cool, and afterwards cutting it up and remelting it, care being taken to avoid using too much heat. An ordinary glue-pot is a convenient vessel for this purpose.

If the thing to be copied is upon a base, it is to be surrounded with a frame of wood, paper, clay, or other similar material, and carefully oiled; the glue

composition is then to be poured into the frame, quite warm. If a figure or bust is to be copied entire, it must be suspended by threads within a box or frame, so as to be surrounded by the composition. When set, if the original cannot be withdrawn without, the mould must be divided with a thiu sharp knife, or by means of threads previously laid in a suitable posture upon the model. If the original can be extracted without dividing the mould, any number of plaster casts may be withdrawn in the same way. For immediate use, the treacle may be dispensed with, but the glue alone is decidedly inferior to the composition. These moulds may be used for casting wax as well as plaster, provided the wax is not poured in too hot. Plaster moulds, if used for wax casting, should be well saturated with water, to prevent adhesion. To harden plaster moulds, previous to casting plaster in them, take half a pint of boiled linseed oil, one ounce of oil of turpentine, and brush the mixture over the plaster repeatedly till it will absorb no more; then put the mould by for a day or two, when it will become very hard with a good surface, and may be used as before directed.

With respect to the means of hardening the plaster in casting, alum-water is said to have this effect, but I have never tried it. It is necessary to use the finest and *freshest* plaster—to mix it smoothly and free from air-bubbles, when the most delicate impressions may be obtained, leaving nothing to be desired on that head. The effects obtained by the stereotype process especially in copying the finest wood engravings, show how perfectly good plaster will copy the finest lines.

A casting being once obtained, possessed of the desired accuracy, it may be subsequently hardened and rendered durable in several ways; one is, to give it several coats of isinglass, parchment, or other fine size, and when it bears up, a finishing coat of copal varnish.

It has been proposed by Sir John Robison, secretary of the Royal Society of Edinburgh, to take casts of the smaller animals in plaster by means of the elastic moulds, and therefrom by Mr. Spencer's Electrotype process, metallic counterparts, for the purposes of ornamenting silver and plated goods; in lieu of the distorted and unnatural figures, now too often introduced for want of better. In this respect, the discovery of our countryman, Mr. Spencer, seems most opportunely to supply our artisans with a ready means of keeping pace in their productions with the improved and improving taste of the age. What may be the value of this discovery, or what the extent of its usefulness, it is at present impossible to say. They are both immense, but *how* immense, future generations only can determine.

I am, Sir, yours respectfully,

WM. BADDELEY.

London, November 30, 1840.

CONDENSATION BY SURFACE REFRIGERATION AND BY INJECTION.

SIR,—In Mr. Fox's communication in No. 898, touching the relative merits of condensation of steam by surface, or by the reinjection of cooled water, it is stated that in Mr. Hall's method, an engine of 200 horse power *only* requires 13 gallons of water, converted into steam per minute, that is 125 cubic feet of water per hour; while in Symington's or Howard's method of condensation in an engine of similar power, 1213 gallons would be required to be cooled per minute for reinjection.

Mr. Hall, in a published statement, allows 60,000 cubic inches of steam = 34.65 cubic feet per horse power per minute, equivalent to 248 cubic feet of water per hour for a 200 horse power engine.

It is just possible that Mr. Fox in his calculations may have omitted the fact that two engines are commonly employed in steam boats.

"Scalpel" does not seem to have examined how far these figures, which he has admitted into his letter, coincide with his subsequent assertion that, "in both cases the same quantity of caloric has to be taken from the same quantity of steam." Judging, however, from Mr. Fox's expressions respecting the impossibility of cooling 1213 gallons in comparison with 13 gallons of water contained in steam, that he may have a temperature blunder in reserve, I conceive the common proof of "Scalpel's" assertion may be adverted to with propriety. Now the latent heat of atmospheric steam is about 970°. The temperature, or sensible heat in the present case is the difference between 100° and 212° = 112° making together 1082° absolute heat to be extracted from each gallon of water contained in the steam; but this amount requires multiplication by 13 gallons, and the common equivalent expression is 14066 gallons reduced 1° of temperature.

The difference of the temperature of the injection and hot well water may be taken at 40°; then $\frac{1080}{40} = 27$ times as much injection water, as the water in the steam to be condensed. If the difference is taken at 30° then $\frac{1080}{30} = 36$ times.

This amounts to 351 and 468 gallons respectively for the condensation of 13 gallons of steam water per minute, and consequently the equivalent is 14.040 gallons reduced 1° of temperature (the difference arises from the omission of fractions). So much for theory. In the only practical investigation that ever came to my knowledge of the amount of injection used in a land engine as compared with the boiler supply, the actual amount of injection exceeded the calculated quantity by one-ninth. Mr. Fox seems to have allowed 1213 for 200 horse power, instead of 702 for 40° and 936 for 30° difference in the injection water and hot well, amounting to an enormous excess; this, however, may be in some degree accounted for by commen practice in marine engines, which are often worked much beyond their nominal power. Engineers also are apt to supply the *fashionable* demand for a very perfect vacuum by the simple means of an extravagant amount of injection water, and moreover steam from sea water seems to require more injection than that produced from distilled water. In comparative cases of this nature the exact theoretical quantities of heat to be abstracted from water contained in steam producing the same power, must be used—until such time, at least, as correct practical data can be supplied.

The advantage of Howard's and Symington's method of cooling injection water, instead of the steam, it seems to me, will depend on the time, which can be allowed instead of the instantaneous action necessary in Hall's plan, and I concur most heartily in "Scalpel's" views, as soon as practice shall have determined the requisite area of pipe surface.

Having formerly made some calculations relating to Howard's method of condensation by the reinjection of cooled water, in a case where the *cooling water* was of an appreciable money value, no doubt remains on my mind that this plan, and consequently the simpler scheme of Symington, are both well adapted for marine engines.

Your's faithfully,

S.

December 7, 1840.

MR. SYMINGTON'S SYSTEM OF CONDENSATION.

Sir,—When, in replying to Mr. Fox's letter in No. 898, of your Magazine, I stated that I had no wish to say a single word against Mr. Hall's invention, and would not allow myself to be dragged into any controversy on the merits of our respective systems. I may add—nor will I take part in a controversy which, in my opinion, is neither edifying or useful.

Before taking leave of this subject, however, allow me to make a remark or two. "Honestometer," who calls himself a "fellow labourer in the vineyard," with Mr. Fox, seems much puzzled to know how it is possible to cool 1200 gallons of water by my plan. Far be it from me to say this is weakness of comprehension on his part; on the contrary, I am sure that had "Honestometer" applied the "desirable brush" to his own eyes as well as he has to those of your readers, he would have discovered that it is quite possible to cool double that quantity if needed. I must admit, indeed, it is enough to stagger some of Mr. Fox's hearers to be told so much was done with the *City of Londonderry's* engines, and that too (according to Mr. Fox's own showing) with "even less surface than that applied to the ten-horse power engine at the bleaching concern."

In conclusion, I have no ill-feeling towards Messrs. Fox and "Honestometer," but wish them every success. Seeing they have taken to "a vineyard," their labours may be expected to be fruitful; however they must bear in mind not to call out "sour grapes," should they happen to hang beyond the reach of the Fox.

I am, Sir,

Your most obedient servant,

WM. SYMINGTON.

Wangye House, Essex,
December 10, 1840.

ON THE VARIOUS PLANS PROPOSED FOR PRODUCING UNIFORMITY OF RATE IN THE PERFORMANCE OF MARINE STEAM-ENGINES.

Sir,—It would seem, from the many efforts which have of late been made, to effect an equalization, at all times, of the load upon, to the power of, marine steam-engines, that such an equalization is an object which it would be very desirable to attain. Having made myself, in some measure, acquainted with many of the plans for the purpose, and given them some consideration, I am induced to think that the following observations may not be altogether unworthy the attention of those of your readers who have not specifically directed their attention to the subject; and, under this impression, I make bold to transmit these remarks to you, for publication in your valuable periodical, if you should deem them worthy of such distinction.

The importance of a uniform rate of working for the steam-engine, is so plainly appa-

rent in the many accomplished contrivances of Watt for the purpose, that it does not seem to me at all necessary to make, on this point, more than the passing observation, that I take it for granted, that a steam-engine, whether land or marine, will most economically perform the work allotted to it, when it uniformly makes a certain number of strokes per minute. In a land-engine uniformity of speed is attainable by many contrivances which are totally inadmissable in the case of a marine-engine; nevertheless, this engine, under common circumstances, is not less liable to inequalities, in the load upon it, than a land-engine.

Marine-engines, to perform at a uniform rate, when the vessel to which they belong is fully laden, require that the paddle-wheels, which are to be driven by them, should be immersed to such a degree, that the resistance of the water to the passage of the paddles may be just sufficient to restrain the action of the engines to the proper number of strokes per minute. Now, if no variation in the quantity of the cargo of a steam-vessel took place, or if no change in the nature of the impediments to the progress of the vessel was effected, by varying winds and states of the sea, it would be clear that uniformity of motion of the engines, once obtained, would operate continually. But, it is evident, that variations of the kind just mentioned, must have place, and particularly in respect of the cargo, when it is considered that a large part of this is in vessels which make any great length of voyage, composed of fuel which is continually lessened by the consumption of the engines. It follows, from any dimunition of the quantity of fuel that the vessel will become lighter, will therefore be less immersed, will likewise have the wheels less immersed; and, as the curve of immersion of these is less, the paddles of them will meet with less resistance, in consequence of there being a less quantity of paddle-board immersed at any one time: the resistance of the water to the paddles being less, the load upon the engines will also be less, and these will make more than the proper number of strokes per minute, or make the proper number with less effect. A little consideration will suffice to prove that, in respect of the cargo alone, it is utterly impossible with the common wheel to attain uniformity of motion in the engines. Variations, in the force and direction of the wind, and in the smoothness and roughness of the water, will be also found, upon reflection, to be capable of preventing the desired uniformity of action from being attained. Some contrivance, therefore, is indispensable, if we would attain that rate of speed for the engines which experience has proved to be highly useful. Various plans, which have at different times been proposed with this purpose in view, it is now my intention to describe, in the chronological order, as far as my knowledge goes, of their publication.

The simplest and rudest method was that of using the paddles rigidly fixed by bolts to the spokes or arms of the paddle-wheel, and shifting them whenever the rate of working of the engines had become too great. It is clear that such a process would always be tedious and sometimes dangerous, and, from the long intervals at which it could only be practically performed, the desired effect could only be attained in a very imperfect manner.

A process was brought before the Society of Arts, many years since, by Mr. Jonathan Dickson, and consisted of a method of lowering and raising the paddle-wheels by means of a peculiar apparatus which is described at length, in vol. 2 of the New Series of the Register of Arts; by which plan each paddle-wheel was made to perform a part of a revolution round the main shaft of the engines, this shaft being fitted with a toothed wheel, which worked into another toothed wheel fixed to the end of the paddle-wheel shaft, which last shaft was therefore necessarily distinct from the main shaft of the engines. Such an apparatus would effectually answer the purpose for which it was designed; but objections to its use arise in the nature of the machinery required to effect the purpose, and in the want of fixedness of so large and weighty an apparatus as a paddle-wheel; and another objection exists in the circumstance of the apparatus by which the purpose is attained, being continually in action. The engine in this plan does not, as in the common method, at once turn the paddle-wheel, but transmitting its power by means of the toothed wheel at the extremity of the crank shaft to the toothed wheel upon the paddle-wheel shaft, turns this shaft, and, with it, the wheel. There is therefore required in this plan one bearing more for each wheel than in the ordinary method; from which there necessarily arises some friction, to which may also be added another amount of friction, arising from the transmission of the power from the main shaft to the paddle-wheel shaft, by the intervening toothed wheels.

I propose now to notice a plan of effecting the end in view, by a means, which if it has ever been considered capable of attaining it, at least is not generally so. The plan consists of a paddle-wheel, the paddles of which enter and leave the water edgeways, and it is commonly known under the name of Morgan's wheel, though it was originally invented by Mr. Elijah Galloway, and was secured to that gentleman under letters-patent, dated the 2nd July 1829, but having since passed into the hands of Mr. Morgan, and been

subsequently improved by the latter gentleman, it is now better known by the name of its present owner than by that of its original inventor. Those of your readers who may not be acquainted with the plan, I beg to refer to No. 598 of your Magazine, in which will be found a full description and illustrations of it. This method has been extensively used in the Government Steam Marine, and has been found to possess the advantageous effects of better employing power than the common paddle-wheel, and in preventing the violent shocks to the machinery, and the vibration to the vessel, which so disagreeably wait upon the employment of the latter instrument; but, from a defective construction of its framing, and from some of the working points being always immersed in the sea-water, and becoming corroded by its action, the continual and expensive repairs consequent upon these circumstances, have been so great, I have been informed, as to have caused it in many cases to have been discarded from use. Of course, if these objections were not capable of removal, this method must naturally expect to receive its doom; but I shall presently speak of a plan which does propose to entirely obviate these objections. My present object is, however, to show that this wheel is almost perfectly capable of effecting an equalization, at all times, of the load to the power of the engines.

Those who have considered the form of curve which a paddle, of the wheel under consideration, makes when it is passing round the centre of the wheel to which it belongs, will appreciate that the paddle, during a large part of its path, both before it enters and after it leaves the water, passes with its edge only, as far as regards all practical objects, opposed to the water; and that, consequently, if the wheel were immersed to such an extent, as to immerse the paddles during these portions of their paths, the paddles, which thus presented their edges only to the water, would be no more resisted than if they were out of the water altogether, now, if a wheel of this kind was so used that, while the paddles were passing through the parts of the curve, which are between the heavy load and light load waterlines of the vessel, they should present only their edges to the water, it is clear that the paddles, during these parts of their passage, would meet with no resistance, and, consequently, as regards the curve of immersion of the paddles, these, (the paddles,) would be entirely unaffected by any varying immersion of the vessel.

It is very common to talk of a denser sort of water at different depths, but a proper acquaintance with the nature of water must at once show that, though mathematically speaking there is a greater density at a greater than at a less depth, yet, to produce a very slight increase of density, it requires the pressure of an enormous force, or that the depth of the water should be exceedingly great—circumstances which do not obtain in the case under consideration. Nevertheless, from the greater quantity of water, above any water to be displaced by a paddle, there evidently results what is almost tantamount to a denser medium, when the velocity of the paddle is great. Now, though this must always operate, and it is an advantage belonging to this wheel, which does not appear to have been properly considered and turned to use, it will not be of so great an amount, as to prevent this wheel from being equally competent to attain the desired equalization of load, with even the best of all the others. With this wheel, the curve of resistance to the paddle will always, whatever the probable immersion of the wheel, be pretty closely the same, and, by the size of the wheel never being lessened, or its rate of revolution never being much retarded, there is greater possibility of the speed of the vessel being pretty equally maintained at all times. Add to this the absence of all adjusting machinery, and it does not appear too much to ask a little allowance, on the score of frictional wear, upon some of the working points of the wheel. The peculiar property of this wheel is, that it gives practically the utmost possible effective return to any amount of power employed upon it, as will become evident to any one, who will take upon himself the trouble of inquiring scientifically into the subject. It, besides, is capable of equally giving this beneficial return to power when working at great, as at little depths; though, when made to work at greater depths, there results the advantage of using larger wheels under the same sized paddle-boxes, as respects the diameter of these boxes, in consequence of the machinery being capable of being placed much lower in the vessel; there would also arise greater steadiness in the vessel from the machinery being brought lower; and, from the greater velocity and greater depth at which the paddles of this wheel might work, either a considerably narrower paddle-wheel could be required, or a less number of paddles to the wheels might be used: besides, it is not of importance, in this plan, to have the very great number of paddles which is employed with the common wheel, inasmuch, as with this wheel, it is of little consequence whether large or small paddles be used, because each paddle, whether large or small, from the peculiar action of the wheel, enters its path of working edgeways, and, practically, acts like a paddle, which expands from a line equivalent to its edge, into one equal in size

to its whole surface—in fact, every paddle acts upon the engine with the gradually increasing and decreasing pressure of a spring. I have been rather surprised that, in trying this plan in the river, it should have been thought proper to use it nearly under the same circumstances as the common paddle-wheel; that is, with only a slight degree of immersion, inasmuch as the advantages of this plan can never be brought out, except under those circumstances, in which its superiority is undeniable over the common wheel. If it had been employed in the most effective manner, we should, I think, have seen narrower wheels, less spray, and less crankness in our fast river boats, than have obtained.

With a view to obviate the disadvantages arising from the weakness in the framing of the last plan, the author of these remarks brought forward another solution, of the problem upon which the last wheel is constructed, which admitted of the application of a framing, equally strong with that of the common paddle-wheel, and which allowed of great decrease in the cost of construction, and prevented all that wear upon the working points, which arises in the last plan from a yielding of every part of the framing. This plan is illustrated and described in No. 800 of your Magazine, to which I must refer such of your readers as may be desirous of acquaintance with the method. It was secured under letters patent, dated 27th February 1838, with other plans, some of which will next be noticed. Since the patent was specified, the author has turned his attention towards a means of obviating the action of the sea-water upon the working points of the wheel, which are necessarily immersed in the water; and he has been successful enough to attain two plans of effecting the end he had in view.

From some similarity in parts of this wheel, it was at first thought to be only a variation of the plan which came under the right of the owner of the wheel last described; but an attentive examination of this wheel, and an acquaintance with the extent of Mr. Morgan's claim, and what was previously done before the date of the patent which Mr. Morgan holds, it will clearly appear that this plan does not trench upon the patent of the gentleman just mentioned; and, if any thing were wanting to disestablish all identity, it would be found, first, in the circumstance that the geometrical process, by which the position of the eccentric centre is found in Mr. Morgan's wheel, is totally inapplicable and useless in the case of this wheel; and, secondly, in the condition, that every working point, in the two combinations, is in as opposite and different relative positions as possible: in fact, no one of the working points, except the centres of the paddles and the centre of the paddle-wheel shaft is in any thing like the same position in the two wheels: and, it is scarcely necessary to observe, that the similarity of position of these points in the two wheels, can give no colour to identity of plan between the two methods; because, in all wheels having moveable paddles, the positions of such points must ever be the same.

The next plan to be noticed was also brought forward by the author of these remarks, under the patent before mentioned, and by this it was proposed to use the framing of a common wheel, but to fit it up with an apparatus for moving the paddles, upon the spokes of the wheel, from or towards the centre of it: by which plan, whenever the vessel became lighter or heavier, the curve of immersion of the paddles was increased or decreased to such a degree, as to equalize the resistance of the water to the paddles; and, by this means, the load to the power of the engines. A vessel, fitted with wheels of this kind, would, at the period of her departure from a port, have the diameter of her wheels of the smallest necessary measure, and, as the vessel became lighter and lighter, from the consumption of fuel, the wheels would be essentially made larger and larger, by the paddles being thrust further and further from the centres of the wheels. The apparatus, designed for the purpose, of effecting this difference in the diameter of the wheels, was at once strong and effective, and the desired effect could even be produced by it, while the vessel was in motion; though it would never be necessary or desirable to produce the effect under such circumstances. Some persons have thought that this wheel must be rendered so much smaller, at the commencement of a voyage, that the effect, from an increased number of strokes of the engines, would be counterbalanced by the result attendant upon the diminution of the diameter of the wheel: in other words, that, though the engines made more strokes, the paddles would not travel faster. To explain this idea more clearly, I will suppose that, with wheels of 20 feet diameter, the immersion of a vessel and its wheels is so great, that engines, which should make 20 double strokes per minute, make only 17 such strokes. Under such circumstances, the speed of the circumferential parts of the wheel would be 20, multiplied by the proportion of the circumference to the diameter, or 3·14, and the product again multiplied by the number of strokes per minute, or 17; which process would give 1067.6 feet per minute. Now the persons before mentioned imagined that the diameter of the wheel must be decreased, in exactly the same proportion as the number of strokes of the en-

gine was increased; or that, in order to enable the engines to make 20 double strokes per minute, it would be necessary to reduce the diameter of the wheel to 17 feet; in which case, by multiplying this new diameter by 3·14, and this again by 20, or the number of strokes, we should have a speed of the paddles of 1067·6 feet per minute, or exactly the same as when the engines made only 17 strokes per minute. Were these persons right in their conclusions, the plan under consideration, whatever attempts might be made to bolster it up, would, and must, deservedly fall to the ground; because, it is evident, that by adopting this method, we should, under such circumstances, be employing machinery, the ultimate end of the use of which would be, to produce, from 20 cylinders twice filled with steam, precisely the same effect, as with the common wheel, we could produce from only 17 cylinders twice filled with steam; which is as much as to say, that, with a greater expenditure of fuel, we could produce only the same effect as with a less expenditure—clearly no very flattering recommendation of the plan. But independently of many considerations, into which it is not necessary now to enter, such a result could never wait upon this plan, as will be seen from the following imagined case, by which, it will be perceived, that the curve of immersion of the paddles diminishes, in a much greater proportion, than the diameter of the wheel. To explain this, let us suppose that, when a vessel is fully laden, the resistance against the paddles is such, that the wheels, which ought to make 20 revolutions per minute, make only 17. Let us suppose further that the wheels are 20 feet in diameter, and that they are immersed to the extent of 1½ foot of their radius. Now, if the persons before mentioned were correct in their ideas, it would be necessary, in order to produce 20 revolutions of the wheels per minute, to diminish the circular path of the paddles to a diameter of 17 feet. But what would result under such circumstances? Why, such a diminution, in the path of the paddles, would clearly take them out of the water altogether, and the engines would be without any load at all upon them; and, in order to produce the requisite load, it would be necessary to enlarge the circumference of the path of the paddles, until the desired number of revolutions of the wheels or double strokes of the engines was obtained; which, from what has just been said, it is clear would cause the circular path of the paddles to be of considerably greater diameter than 17 feet, and not very greatly inferior to the original diameter of 20 feet.

Even under such circumstances, it must not be imagined, that the vessel would go as fast as it would if the wheels made 20 revolutions, when they were of 20 feet diameter; because, it is clear, that though the full power of the engines might be brought out, the resistance to the passage of the vessel would be greater, in one case than in the other, from the greater increased sectional area of it. But, from the nearer approach in speed of the paddles to the full speed of these, we might expect to obtain a greater rate of speed for the vessel, than if the paddles travelled through a space represented by a circle of only 17 feet in diameter, or diminished in the proportion of 17 to 20: for, I think it will be allowed, that, with wheels, travelling at the lesser rate, we could not hope to attain the speed that we could, if these travelled at the greater rate. There must always be maintained some differing proportion, between the speed of the vessel and the speed of the paddles, and though we might expect to attain a speed of 10 miles an hour for a vessel, when the wheels of it were travelling at the rate of 15 miles an hour, we could hardly expect to maintain the same rate of speed for the vessel, when the wheels were travelling at the rate of only 10 miles an hour; for, if we could obtain this speed, under these altered circumstances, we should have the vessel travelling at the same rate as the wheels. It is clear, that, without taking other circumstances into consideration, the wheels could not, under such conditions, be exerting any propelling power, and we should find the vessel fall off in speed, until there existed, such a difference, in the rate of speed of it and the wheels, as should be capable of keeping the vessel at a uniform rate of motion, which would be considerably under the rate of 10 miles an hour.

From what has just been stated, it appears to be desirable to keep the path of the paddles continually as near their greatest path as possible; for, while this is maintained, we may expect to obtain the greatest speed for the vessel, and, it has been seen, that the plan under discussion does in a very great degree effect this desirable end; for it has been shown that the path of the paddles, is not diminished in near the same proportion as the resistance of the water to the passage of them. But, it may be seen, that this method does not attain the utmost possible approach to the greatest speed of the paddles which is so desirable; and I shall now show another plan, more capable of attaining this end, also by the author of this paper, and described in the specification of the patent before mentioned.

By the last method it was proposed to accommodate the diameter of the path of the paddles to the varying immersion of the wheels; but, by the plan about to be described, it was intended that the path of one portion of the paddles should be con-

stant, while the variation, in the resistance, should be obtained by enlarging or lessening the surface of the paddle-boards; or, in other words, by reefing the paddles of the wheels. In this method a certain quantity of paddle was proposed to be fixed permanently, at the extremities of the arms of the wheel; which quantity was never to be greater than the engines could drive at their proper speed, under the most unfavourable circumstances; and, in order to adjust the resistance of the water to the power of the engines, it was proposed, by means of machinery of the same kind as that used in the plan last mentioned, to draw out, from behind the fixed portions of the paddles, other moveable portions, so that as the vessel became less immersed, the quantity of paddle-surface resisted by the water should be increased. The process to be pursued, under this plan, would be, when a vessel was fully laden, to shroud all the moveable paddles behind the fixed ones, and, as the vessel became lighter and the resistance against the fixed paddles became less, to draw the moveable paddles, gradually beyond the fixed paddles, towards the centre of the wheel; in which case, as the curve of immersion of the paddles continually become less, the quantity of paddle-surface would continually become greater, until the whole of the moveable paddles were unshrouded; at which time, it is assumed, the vessel would have acquired her least degree of immersion, as far as her cargo of fuel was concerned. From a consideration of this plan, it appears that the path of the fixed paddles is unvarying in speed, though it is true the path of the moveable ones is of different lengths; but as the total rate of speed of the paddles clearly approaches nearer in this plan than in the one previously discussed, to the utmost possible rate of speed attainable, if the paddles were used continually at the utmost distance from the shaft that the wheels would allow, so we may hope to obtain with this plan, agreeably to what has been before stated, a greater speed for the vessel than we could hope to get with the former plan. Besides, as regards the means of using the machinery necessary to produce the equalization of resistance, this plan has some advantage over the other, as regards the prevention of the corrosive action of the sea-water upon the arms or spokes of the paddle-wheels. It may be remarked, that the machinery requisite to this plan, though not so simple, as experience has since shown, it might have been, was perfectly capable of effecting the object in view; and, unlike that of some of the methods which are mentioned in these observations, was never in action, except for the short time during which the adjustment was made, being at all other times perfectly at rest, and incapable, by friction or otherwise, of diminishing the power of the engines. The objections which may be urged against the last two plans are, that the requisite apparatus would add considerably to the first expense as regards a common wheel, and that there might arise some wear from the action of the sea-water upon a few exposed parts of the apparatus. The last objection may now be entirely obviated by the adoption of plans proposed for this purpose by the author of these remarks. Such of your readers as may require a description of the last two plans, I must refer to No. 812 of your Magazine.

The next plan proposed for the attainment of the desired equalization of the load to the engines, is altogether different from any of the preceding, and the object is effected without any alteration in the path of the paddles, this being attained entirely within the vessel. It is described in the specification of a patent, granted to Messrs. Maudsley and Field, on the 7th of May, 1839; a detail of the objects of which is contained in No. 30 of the *Civil Engineer and Architects' Journal.* In this method it is proposed, by the employment of larger or more numerous cylinders to the engines, to attain an equable rate of speed for the engines at all times, by means of using steam of different density at different times; at times when the vessel is deeply laden, steam of the ordinary pressure is proposed to be used, the cylinders being of such a size that such steam will be capable of driving the wheels, and, of course, making the engines work at a proper rate. At other times, when the vessel becomes lighter, and the resistance of the water to the paddles less, steam of less density is intended to be employed; so that in this way the engines and the wheels will always work at a uniform rate. But this plan is not without its objections, as will now be seen.

The employment of larger or more numerous cylinders to be filled with steam of the full pressure, under adverse circumstances, such as when the vessel is fully laden, or exposed to the action of strong head winds or a heavy sea, infers the accompaniment of larger boilers, and all the concomitants of larger and heavier engines; and all this, it should be remembered, for use only under adverse circumstances. Now, as the adverse operation of the lading of a vessel, as far as this is dependant upon fuel, is greatest when the vessel first sets out, and lessens gradually day by day; and as any objection upon the score of head winds and heavy seas can be but of partial occurrence, it may be worth while to hesitate before employing machinery truly powerful enough for the worst occasions, but at all other times acting as an incumbrance in taking up space,

and loading the vessel unnecessarily; and these objections become more important when we consider how small, comparatively speaking, and how valuable, is the space which is left for freight in even the largest steam vessels. It should, however, be observed, that this plan comes accompanied, in the patent, with improvements calculated to save space and weight, and even with the more cumbrous parts just mentioned, the space taken up in the vessel is less than is taken up under ordinary circumstances; but it perhaps might have been as well to have made the improvements which save space and weight, without attaching to them others having precisely a contrary effect. The plan, however, with these objections, is perfectly competent to attain the end proposed, is capable of nice adjustment, and acts entirely within the vessel.

The next plan to which I come, is that of Mr. Samuel Hall, secured under letters-patent, dated 7th October, 1839. A description of this plan, together with an able comparison of it with one of the plans by the author of these remarks already described, is given in No. 874 of this Magazine. Concurring exactly in the observations therein made, I shall only remark of this method, that all that has been said of the second before-mentioned plan of the author of this paper, is equally true of this one; while it may, in addition, be remarked of this, that some of the machinery, by which the end is obtained, is more simple and less costly of manufacture.

We next come to a plan by Mr. George Rennie, included in the specification of letters patent, granted the 26th November, 1839, and described in No. 879 of this Magazine; by which it was thought that, with double and single immersions of a paddle-wheel fitted with trapezium-shaped paddles, the resistance of the water, to the passage of the paddles, would be almost exactly the same. Now, without at all intending to impugn the accuracy of the particular experiments relied on to establish this important property, for such shaped paddles, I must be allowed to doubt the possibility of such results being, in general, obtained with wheels thus fitted. But as an investigation of this subject would take up more space than perhaps would be desirable, I shall say no more than that, to my mind, this plan is incapable of producing the desired effect.

Another plan was described in the Civil Engineer and Architects' Journal for March, 1840, as applied by Boulton, Watt & Co., many years since, to a vessel on the Tyne. This consists of a paddle-wheel, the floats of which are moveable, by very simple, and at the same time, very rudely and incorrectly working machinery, towards or from the centre of the wheel. The construction of this wheel is such, that there is a tendency to jam in almost every part of it, and it could only have worked at all, by unadviseable allowances being made, in order to obviate the ill effects of this tendency.

The next method to which we come is one by Mr. Samuel Seaward, secured under letters-patent, dated 17th March. 1840, for this as well as other improvements. The plan is described in No. 894 of this Magazine, and consists of a method of equalizing the resistance of the water to the paddles, to the power of the engines, by making the wheels sometimes move faster, and, at other times more slowly. Unquestionably this is an ingenious mode of attaining an equable rate of working for the engines, particularly as the machinery for effecting it is contained within the vessel, and is secure from all action of the sea water upon it; but it is not altogether free from important inherent defects. We have here two extra bearings for each paddle-wheel shaft, one on the side of the vessel, and another on the main frame of the engine; these extra bearings, it is clear, must be attended with some loss on the way of friction, and there will also be some loss on this account, in the transmission of the power from one toothed wheel to the other; and it should be recollected that this friction is constant, the equalizing apparatus being continually in action. But an important point, which appears not to have been duly considered, consists in the expectation that, when the paddles revolve with the lower rates of motion, something near the same speed for the vessel will be obtained, as when they revolve at the highest rate: I think this expectation is not warranted. For, suppose, when the wheels make 20 revolutions per minute, the circumferential speed of the wheels is 15 miles an hour, and the speed of the vessel one-third less, or 10 miles an hour. Now, if the speed of the wheels should be reduced to 17 revolutions, the speed of the vessel would be, if the same proportion, between the speed of the wheels and the speed of the vessel, were preserved, only (20 : 10 : : 17 :) 8½ miles per hour; and if the speed of the wheels should be further reduced to 14 revolutions, and the same proportion maintained between the speed of the wheels and the vessel, then the speed of the vessel would be reduced to (20 : 10 : : 14 :) 7 miles an hour, which is no very great speed. I must not, however, be here understood to assert that the same relation would exist between the speed of a vessel and the speed of its wheels, however much the rate of the wheels might be reduced; but it is quite clear, that unless the rate of the vessel is diminished in some pro-

provision on the part of man. The proportion, as the rate of the wheels is diminished, we should find, under certain degrees of diminution of the rate of the wheels, that the vessel would be travelling as fast as, and even faster, than its wheels—evidently impossible occurrences. I do not mean to say that no portion, of the useful effect desired, will be obtained by this plan; but that not near so much will be, as may be expected from a first view of the plan, or as might be by some other methods mentioned in these remarks. It appears impossible, under this plan, to effect any nicety of adjustment; because, to do this, would necessarily require more toothed wheels than it might be convenient to use: practically, however, perhaps the three adjustments, set down in the description of the plan, would be all that would be generally necessary.

Another plan by Mr. Wilson, was described in No. 869 of the Magazine, which consisted of an expanding and contracting paddle-wheel. Of this method, the same observations may be made that have been before adduced in respect of other wheels of the kind; but, specifically of this plan it may be remarked that, there is a great tendency in some of its parts to jam; and, during a part of the contraction, a great disposition to rend some of the parts asunder, rather than to effect the contraction of the wheel.

In the same number of the Magazine, another wheel of the kind is described, invented by Mr. Oxley. The same observations generally apply to this as to all other wheels of the sort; but of this, it may be particularly observed that, the complexity of the contrivance is such, as to preclude all idea of the adoption of it.

And now, Sir, having, as I think, fairly set forth the plans which have been brought forward to attain the end desired, I shall conclude my remarks, by offering every apology for this long trespass upon your valuable space, and by subscribing myself,

Sir, your most obedient servant,

J. P. Holebrook.

168, Devonshire Place, Edgeware Road,
October 2, 1840.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

William Bush, Camberwell, Merchant, *for improvements in fire-arms and in cartridges.*—Enrolment Office, November 20, 1840.

These improvements relate to the construction of guns, &c., which are to be loaded at the breech, in connection with a peculiar construction of cartridge.

The barrel of the gun or musket has a slit or opening at the hinder part to receive the apparatus forming the breech; at the end of which slit or opening two pieces are brazed on, each having a hole through which a screw passes, forming a fulcrum for the breech, which moves backward and forward, into or out of the end of the barrel by means of a lever connected to it by a parallel motion. The hammer and springs are placed within the stock, the discharging trigger projecting below within the trigger-guard as usual.

At the end of the breech there is a hole, closed by a hollow shear steel screw filled up with pewter through which the touch hole is drilled. The object of this is to avoid oxidation, and to obtain elasticity so as to fill up any cavity made by the fitting of the discharging needle, or by the sliding of the breech. The discharging needle lays just within the hole in the compound screw and opposite to the hammer of the lock.

The hammer is raised by means of an external lever connected with a crank; on pulling the trigger the hammer strikes upon the needle driving it forward into the centre of the cartridge where it ignites the percussion powder and fires the charge. The construction of sporting guns and muskets according to the said improvements, is clearly set forth in the specification, as also the mode of adapting the same to guns of the present construction.

The cartridge is made by taking a circular disc of wood, or two card-board boxes, like two pill box lids fitted one within the other, having a hole in the centre in which a percussion cap or patch is placed, and held there by being covered with a piece of calico or other similar fabric. Around this as a base, the paper cylinder or case is formed and filled up with the proper charge of gunpowder, and shots or a ball as the case may be.

The claim is, 1. The mode of constructing the hinder ends of the barrels of fire-arms, in combination with the means of constructing and moving the breech, 2. The mode of constructing cartridges and applying percussion powder to the interior of the cartridge and at the back of the charge of gunpowder.

Christopher Dain, Edgbaston, Warwick, Gentleman, *for certain improvements in the construction of vessels for containing or supplying ink and other fluids.*—Enrolment Office, Nov. 30, 1840.

What are here styled "*improvements,*" would be more properly described as "additions to" fountain inkstands. When man attempts to improve upon the works of nature, he generally misses his mark; the fountain inkstand, it is well known, maintains a uniform level of fluid in the dipping cistern, from natural causes, independently of any extraneous help or

sent patentee has attempted to supersede this perfect principle, by a complicated appendage, which we will endeavour to describe to our readers. The body of the inkstand is made spherical, with a prolonged tube or neck issuing from its lower end, and turned up to form a dipping cistern; about the middle of which tube there is a circular opening on its upper surface. This body, which is of glass, is cemented on to a metal slab or stand; a saddle-piece of brass is placed across the neck directly over the opening before described—a short tube rising from which encloses a square brass pillar terminating in a quick threaded screw, having on its lower end a cork of such a size, as to enter the orifice in the glass neck, and close the communication between the ink reservoir and the dipping spout. Within the tube over this opening there is a nut in which the valve-screw rises and falls; the nut is turned by a key fitting on to a square spindle, while the valve screw is prevented from turning by its shaft working through a square guide. A brass stem rises from the saddle piece to the top of the reservoir, where another square headed screw and cork closes an aperture, which is termed the air-valve.

To charge this inkstand, screw down the *ink-valve* so as to shut off the communication with the dipping spout; then open the *air-valve*, through which the ink is to be introduced by means of a funnel which forms part of the requisite appendages; when the reservoir is filled, the air-valve is to be shut. For use, unscrew the air-valve first, then unscrew the cork which forms the ink-valve, and allow the ink to flow into the dipping cistern, but be very careful to shut off the valve the instant the cistern is filled, or the ink will overflow, staining all such matters as presume to impede its progress. We fancy an inkstand constructed agreeably to this specification could never act—and if it did, we know not who would be troubled to use it; there is evidently a vast deal of pains taken to spoil what *was* originally a good inkstand! The claim is, for the introduction of a valve or stopcock placed between a reservoir for the ink or other fluid, and the vessel or cistern from which it is taken to be used, whatever may be the form or construction of the valve or stopcock so employed.

PIERRE DUFAUR DE MONTMIRAIL, FORMERLY OF LONDON WALL, BUT NOW OF PANTON-SQUARE, HAYMARKET, GENTLEMAN, *for certain improvements in the manufacture of bread.*—Rolls Chapel Office, Dec. 1, 1840.

In the first place instead of using pure water for mixing the dough, the following liquid is made use of;—four ounces of gum arabic are dissolved in eight quarts of boiling water; when the gum is thoroughly dissolved this liquid is run off into a cooler, and left till it is of a blood heat, when it is ready for use. Instead of dissolving the salt in water, as is usually done, it is to be thoroughly dried in the oven (but not burned), and afterwards pulverised as finely as possible, in which state it is to be intimately incorporated with the dry flour, by which means it is said greatly to add to its absorbent power, and to cause the gum water to combine more intimately with it. Bread made with the aforesaid liquid, &c., in the ordinary manner, and baked carefully will (it is said) yield a greater quantity from the same quantity of flour, than when made on the old plan; and will be lighter, more wholesome, and more nutritious. The apparatus described consists of a close boiler set in brickwork in the usual way, and furnished with a safety-valve, filling funnel and cock, and exit cock which runs off the liquid into the cooler, which is a wooden cistern lined with lead and furnished with a stop-cock leading into the kneading trough. The claims are, 1. The use of the liquid or mixture herein before described instead of water for wetting the dough. 2. Mixing the salt in a very dry and minutely pulverised state with the dry flour. 3. The apparatus for preparing the said liquor.

JOHN HAWLEY, FRITH STREET, SOHO, WATCHMAKER, *for improvements in pianos and harps.*—Enrolment Office, December 1, 1840.

These improvements consist in the application of tempered steel springs to the above musical instruments, which may be either cylindrical, angular, or quite straight—except for the deep notes, those being thickest in the middle and tapered off toward each end. These wires are to be formed by means of a draw plate having an adjusting screw attached, so as to increase or diminish the pressure at pleasure. The wires are hardened by being heated red hot and quenched in the following mixture, viz. 5 lbs. of tallow; 6 lbs. beef suet; 1 lb. bee's wax; 5 lbs. olive oil; ½ lb. hartshorn in powder, and 32 grains of mercury. They are then to be tempered by blazing off, or any other convenient method, but the extreme ends of the wires must be let down and made quite soft, to allow them to be wound round the pegs of the instrument without breaking.

The claim is for the application of steel springs to harps and pianos, tempered in the manner described,

BENJAMIN WINKLES, NORTHAMPTON-STREET, ISLINGTON, STEEL AND COPPER-PLATE MANUFACTURER, *for certain improvements in the arrangement and construction of paddle-wheels and water-wheels.* — Rolls' Chapel Office, Dec. 10, 1840.

These improvements are designed, first,

in reference to propelling wheels for navigation, to enable the paddles when in the act of propelling to present their broad surfaces to the resistance of the mass of water; and as the wheel revolves afterwards to fall down and rise out of the water edgeways. Secondly, in reference to the form of water wheels known as breast wheels, to construct the buckets by means of falling flaps, which flaps assume the form of buckets on approaching the horizontal position on the breast side, as the wheel goes round, afterwards gradually collapse as they attain the lowest part of their revolution, and ultimately pass out of the water edgeways. The object in both adaptations being that of preventing any retardation of the rotary action of the wheels by the back water. The mode of accomplishing this object in regard to paddle wheels is shown by four drawings, without which it is difficult to make the arrangements understood. Upon the main shaft is placed the paddle-wheel frame, to the outer rim of which a series of curved paddles are jointed by means of axles, which allow them to turn over freely. The outer edges of these paddles, which are formed in a curve corresponding to that of the rim of the wheel, bear upon its outer edge, against which they are successively thrown by the centrifugal force, or by their own gravity. But, in order to bring them into the proper propelling position, a curved eccentric or snail-formed bar is fixed to the interior of the paddle box, or side of the vessel, and a tail lever extends from the back of each paddle, carrying an anti-friction roller or boss, which, as the wheel goes round, coming in contact with the eccentric guide, brings the paddle into its proper position (radiating from the periphery towards the centre of the wheel), ready to perform the propelling stroke. In order that the paddle may be confined in that position, its inner edge is brought against and firmly held by a spring catch affixed to the inner ring of the framing. When the paddle has passed the lower part of its course and performed its office, a projecting stud on the side of the spring catch comes in contact with an inclined bar, which causes the latch to be raised, and the paddle to be set free so as to fall upon the rim of the wheel, and emerge from the water edgeways. In another modification which is described, the spring catches are dispensed with, in which case the eccentric guide is continued round in front of the wheel, and under the lower part of its course. The boss or anti-friction roller, as the wheel revolves, continues acting upon the eccentric, which keeps the paddle in its proper position until it has passed through the most effective portion of the stroke, when the boss escapes from the eccentric, and falls back into the original position. Means for reversing or backing the paddles are provided, by a modification of the tail lever. In another arrangement the snail-formed bar or eccentric is mounted on an axle at its upper end, the reverse extremity being attached to an upright rod in the engine room, so as to be under the immediate control of the engineer. In this case the tail lever of the paddles is not jointed thereto as in the foregoing plan, but is rigid and forms part of the paddle itself. The paddles are mounted on axles as before, and when it is required to back the vessel, the engineer presses down the rod, and thereby lowers the eccentric, which allows the levers and paddles to pass.

The water mill is of the description known as the breast wheel: upon an axle mounted in suitable bearings a series of arms carry the rim of the wheel, which is furnished on each side with a broad flanch; a number of dished or curved flaps are hinged to the close rim, and play freely between the two flanches, forming a series of buckets. The flanches at their peripheries are braced together by a number of bolts, corresponding with the number of, and forming stops for the bucket flaps to rest upon, while in the active position. After the flaps have passed the vertical position, they fall down upon the stops forming buckets which receive the water from the breast or weir. As the wheel revolves the buckets discharge the water, and hang down by their own gravity, until they approach the ascending side, when they will collapse and fall over on to the rim of the wheel, ready for repeating the operations before described.

WILLIAM LANCE, GEORGE-YARD, LOMBARD-STREET, INSURANCE BROKER, *for a new and improved instrument or apparatus to be used in whale fishery, part or parts of which upon an increased scale are also applicable as a motive power for driving machinery.*—Rolls' Chapel Office, Dec. 11, 1840.

These improvements, which form a good practical commentary on "the art of ingeniously tormenting," consist, in the first place, of certain alterations in and additions to the ordinary harpoon or instrument used in the whale fishery, by which it is forced into the body of the whale as the animal proceeds onward after being struck, thereby securing its capture; and also by an arrangement hereinafter described, causing an explosion calculated to obviate the subsequent process of *lancing* at present required in order to kill the whale, by which means a greater number can be secured in one "lowering down." The second part relates to a mode of throwing such instruments, so as to project them with much more force than can be accomplished by the present method; the advantages of which are, the means of taking more steady aim, and of making fast to the whale at a much greater

distance than by the present method; thus avoiding the liability of having the boat stove or upset by the whale, and enabling the crew to capture a greater number, as it is found in the present practice a matter of much difficulty to get near enough to dart the harpoon by hand. Thirdly, in applying part or parts of the before-mentioned apparatus, on a different scale, to the purposes of a motive power, "whereby a considerable saving may be effected in the expenses of driving machinery"! The instrument or harpoon, which is about four feet long, consists of a spindle having a quick motion screw-thread cut upon its entire length. The head of the harpoon is in two parts; the first part or point is fixed to the spindle, while the other, which forms two barbs, is tapped with a female screw of a corresponding thread to the spindle. The opposite end of the spindle is equipped with four vanes (or a screw or any portion of a screw might be used). After the harpoon has been projected into the whale, and the animal attempts to swim away and make its escape, the resistance of the water acting on the inclined vanes will turn them round, causing the screw to revolve, when the two barbs forming an abutment, the pointed end of the harpoon will be screwed into the whale's body; and in the case of a lady whale it may be said—as of Lucretia of old—"she died by her own hand." To serve the purpose of what is termed a "drogue," a hollow metal ball is attached by a line to the vane end of the harpoon, the natural buoyancy of which considerably impedes the whale's progress. The fly or vanes may be attached to the "drogue," and communicate a rotary motion to it through a line. Another contrivance consists of a kind of harpoon head of a conical shape, being made with triangular cutting edges towards the point, and furnished at its base with barbs or flooks (*flukes*) turning on pivots, which barbs expand the moment any strain comes upon the line to which it is attached, and effectually prevent the instrument from drawing out. In another modification, the instrument is made either with or without the cutting edges, but without any barbs; it is, however, furnished with the following means of effecting an explosion, as soon as it has penetrated comfortably into the body of the whale; there are two arms or levers turning on pivots fixed in the hinder part of the instrument, which are made to diverge upon meeting with any resistance from the body of the whale, as the instrument enters. This motion of the levers causes two jaws on their reverse ends to collapse, and crush a *promethean* upon an enlarged scale, *i. e.* a small glass vessel filled with concentrated sulphuric acid and surrounded with chlorate of potass and lump sugar, the contact of which causes instant ignition and fires a charge of gunpowder, &c. into the body of the fish—occasioning no doubt a pretty considerable sensation in the adjacent regions!

The instrument for projecting these deadly weapons consists of a small swivel air-cannon, having a copper ball or magazine for holding the charge of condensed air, placed beneath the barrel as in the earliest contrivances of this kind: the discharge being effected by screwing down a valve which opens the communication, when the harpoon is projected with the velocity due to the compression of the air. A condensing apparatus for compressing the air into the magazine is shown in detail, but contains no novelty. A break, to be used instead of the ordinary "logger-head" of the whale-boat, consists of a barrel mounted on suitable bearings, having a flanch around it, upon which there rests a metal break terminating in a weighted lever, so loaded as to give as much friction and resistance to the running out of the line as may be deemed safe or expedient.

"The application, upon an increased scale, of part or parts of this apparatus, as a motive power for driving machinery," consists in the use of air highly compressed by the before named means; the air is to be condensed into a vessel of sufficient strength, and supplied to the cylinder for working the piston (as in high-pressure steam-engines) after passing through a coil of tubing immersed in any substance which by the application of heat will increase its elasticity. Or it may be supplied direct from the vessel to the cylinder! This head of the patent has reference also to an application of the fly, or vanes, or screw spoken of, in the water, when their faces being placed at an angle to the plane of their motion will cause them to revolve and thus communicate motion through any arrangement of gear-work to the machinery to be driven. This plan is said to be advantageous for ballast heaving, when the vanes should be placed at the stem of the barge; also extremely serviceable for working the pumps used in condensing the air for the before named purposes, viz. shooting whales, or driving machinery. We should imagine the author of these inventions has the organ of "destructiveness" somewhat largely developed, and it is a singular coincidence that this "cut and thrust" patent (which is a communication) should stand in the name of "Lance." The *power-creating part*, of the patent is absurd in the extreme. The claims are,

1. The apparatus in whole or in part, set forth to be used in the whale fishery—to the precise form of which the patentee does not confine himself.

2. The use of compressed air as the means

of projecting any suitable missile for taking or destroying whales.

3. Effecting an explosion in the body of the whale distinct from the use of rockets.

4. The employment of air highly compressed by the means hereinbefore explained as a motive power.

5. The use of the fans, vanes, or screw, for driving machinery in the way stated.

Ezra Jenks Coates, Bread-street, Cheapside, Merchant, *for certain improvements in propelling canal and other boats.*—Rolls Chapel Office, Dec. 11, 1840.

The method proposed for accomplishing this object, consists in the employment of a parallel endless chain of metal or other suitable substance, furnished with a number of small anchors or catches; this chain passes over large pullies at the stem and stern of the boat, and is allowed to lay upon the bottom of the canal or river; upon rotary motion being communicated to one of the pullies by steam, or other prime mover, from being in direct contact with the chain, it causes the boat to be propelled forward, in consequence of the hold or resistance the endless chain and anchors have upon the bottom of the canal or river. The chain is gradually laid along the bottom of the river by the action of the front pulley as the vessel advances, the pulley at the stern of the boat raising the chain from off the ground. The chain passes over antifriction rollers laid along the top of the boat, to the front pulley, from which it is delivered to the ground as before mentioned. A vessel thus fitted up, is called a steam drag or tug, and is intended to draw a number of boats or barges connected to each other in any convenient manner. The driving or actuating wheel, which is placed in the front of the boat, has a series of teeth or projections on its periphery, which take into the links or openings in the chain between the anchors. Under some circumstances it is supposed that by using a heavier chain, the anchors may be dispensed with, as the chain alone in such cases will have sufficient hold or traction on the ground, to enable the steam drag to draw the boats or barges attached to it; while there will be much less disturbance and injury done to the bed of the river or canal. The claim is for propelling vessels on rivers or canals by means of an endless chain or band passed over pullies situated at the stem and stern of the boat, and having part of the length lying along the bottom of the river or canal, for the purpose of obtaining a hold thereon, or means of resistance therefrom, as aboved described, whether such endless chain is used in conjunction with anchors or not. [Although but now selected this plan was published a year or two ago.]

Richard Prosser, Birmingham, Civil Engineer, *for certain improvements in manufacturing buttons from certain materials which improvements in manufacturing are applicable in whole or in part to the production of knobs, rings, and other articles from the same materials.*—Enrolment Office, Dec. 17, 1840.

Potters have been in use to manufacture certain clays and clayey earths, with or without an admixture of other ingredients, as also occasionally some of the said other ingredients (as flint, felspar, &c.) with or without an admixture of clay or clayey earths, into articles of various forms and for various purposes; and in order to reduce these ingredients into a sufficiently plastic state to be worked by the hand of the potter, or otherwise, have hitherto been in the practice of mixing or tempering the same with large quantities of water, and so converting them into an aqueous mass, which is afterwards by partial evaporation or drying, brought into the kneadable state technically called "slip." And in order to expel the large portion of water still remaining in the "slip," it has been necessary to subject the articles formed of the same, to certain drying processes of a laborious and tedious description: in the course of which the articles so manufactured are subject to great shrinkage and change of form, which is extremely prejudicial in the case of all small articles, such as buttons, knobs, rings, &c.

The nature of the present improvements consists, firstly, in manufacturing from the same materials as are ordinarily used by the potter, most if not all those articles which have been or may be manufactured therefrom, but more especially the small articles before mentioned—without the addition of any water to the said materials; whereby the whole of the before named processes of watering or tempering, evaporating or drying (except so far as water may be required in the grinding process), are dispensed with; and all the trouble, delay, and other drawbacks attendant thereon, avoided; and, secondly, in the manufacturing from the said materials, and others, a button of the improved form hereinafter described.

In the first place, clay or clayey earths in their natural state, are pounded or ground into powder; if in their natural state they contain too much moisture to undergo this process, they are to be evaporated until the required degree of dessication is obtained. If an article is wanted of a finer quality than can be manufactured from clay alone, so much of any other suitable substance (as flint, feldspar, &c.) as potters are in the habit of using for making earthenware or porcelain, is to be added, in the state of powder, and in such proportions as will produce the quality required.

Instead of pounding or grinding the materials separately, and mixing them in the

state of powder, they may be ground together, when equally in a state of dryness fit for the purpose. The powdered material thus obtained is to be thrown upon a sieve, having about two thousand apertures or meshes in each square inch, and as much as passes through this sieve is in a state of comminution sufficient for most articles requiring a fine smooth surface. Where so fine a surface is not required, a coarser sieve may be used, taking care that the powder is always of a uniform state of granulation, and not made up of very fine and very coarse particles mixed together. To manufacture such powder into buttons, and other similar articles, a fly-press with suitable dies or moulds are employed. The fly-press is firmly secured to a strong bed or frame: a die carrying on its under face the form in reverse (*i. e.* hollow instead of relief,) proposed to be given to the top of the button, is screwed to the follower of the press. A second tool or die of a sort of T shape, with an impress of the back of the button, fits loosely into a corresponding recess in the bolster. Below the press there is a treddle supported on a fulcrum near its centre, from one end of which a rod passes up through a small hole in the bolster to the lower die or tool. The hollow or recess in the bolster in which this tool rises and falls, is of such a depth, as to be an exact measure of the quantity of powder necessary for the formation of a button; so that this part which may be called the mould serves the double purpose of a gauge for the powder, and a ring or collar to prevent its spreading laterally when the upper tool is brought down upon it. The mode of operation is as follows; the hollow in the mould being filled with powder, and the powder squared off to an exact level with the top of the mould, such power is applied to the press, as will bring down the tool with a force of about 200 lbs. on the square inch, upon the powder lying in the mould, when a solid button is at once formed, which when afterwards fixed in the ordinary way will be found of great hardness, and susceptible of very little if any alteration of form by subsequent exposure to heat or moisture. In order to remove the button thus formed from the mould, the workman gives a contrary turn to the handle of the press, which raises the upper tool, he then presses down the treddle with his foot, which raises the rod at its opposite end, and along with it the lower tool to the top of the recess in the bolster, when the button is removed by hand. The treddle is then released when the lower die descends to its place at the bottom of the recess, when it is in its original state ready for a repetition of the process. If the button is to have a metallic shank attached to it, a recess is formed at the back of the button for its reception, by a corresponding projection on the face of the lower tool or die. The shank being affixed to a small metal cup which is dished so as nearly to fill the recess in the back of the button, a little of any strong cement as shell-lac, &c. is introduced into the recess and while it is in a fluid state the cup of the shank is inserted. When the cement becomes cold the shank will be found sufficiently firm for all purposes to which buttons are usually applied. If a button with holes through it, instead of a shank attached, such as the common four-hole brace button, is required, then tools must be employed, so cut on their upper and lower surfaces, as to produce these holes.

The new form of button, which possesses several decided advantages over the common four-hole button, has only two holes instead of four, with a groove or channel in the upper surface between them: so that when sewn to any garment, the thread will lay in the groove or channel and be thereby protected from abrasion. There is a projection on the back of the button corresponding to the indentation in its front surface, and if the button is sewn on as it should be, in such a manner that the two holes shall be in a straight line with the length of the button-hole, the button will be always inserted with less widening and wearing of the button-hole than is usual with the four-hole button.

The tools necessary for applying Mr. Prosser's process to the manufacture of rings, knobs, and such like articles, are very fully described, but would not be intelligible without the drawings. All that is necessary in each case is to vary the face of the tools according to the configuration desired, by any of the ordinary processes of engraving or cutting, in hollow and relief. A great advantage attending the facility of giving any sort of figured surface to the manufactured article is, that the commonest articles such as bricks and tiles, when manufactured by the improved process, may have at a very small additional cost, any degree of excellence in point of design given to them. A brick produced with *plain* tools by the foregoing process, would have no advantage over bricks made in the ordinary way, except in the greater quickness and economy of the process of manufacture; but instead of the tools being perfectly *plain*, they may be engraved of any form whatever, either in hollow or relief, so as to represent coats of arms, architectural ornaments, &c., and the brick will be produced as readily, and in a state of as great perfection from the graven as from the plain mould; a result considered to be wholly unattainable by any of the modes heretofore in use. When the buttons, or other articles manufactured in this way have

been removed from the press, they are ready to be immediately burned in the same way as articles of earthenware or porcelain are commonly burned; and any required colours may be obtained by adding such metallic oxides to the powdered clay, as potters are in use to employ for the production of these colours. After burning, the articles may receive any degree of decoration by printing, gilding, enamelling, or glazing, that fancy may dictate, in the ordinary manner. When the dies do not exceed two inches in diameter, they are preferred to be made of steel, but when they are of larger dimensions, cast iron answers the purpose very well.

[The patentee calls his process the *dry* process of pottery and brickmaking, in contradistinction to the ordinary processes, in all of which large quantities of water are employed; and certainly it is a process not only of entire novelty, and founded on philosophical considerations of a much profounder character than any developed by the specification, but one which must *produce quite a revolution in this important branch of our arts and manufactures.*]

THE ORIENTAL STEAMER.

Abstract of the Log of the Peninsular and Oriental Steam Navigation Company's Steamer *Oriental*, John Soy, Commander, on her second voyage from England to Alexandria and back:—

	Ports.	Distance in Miles.	Hours under Steam. H. M.	Remarks.
Out.	Falmouth to Gibraltar .	1,009	143 25	Tremendous gales during three days.
	Gibraltar to Malta	989	91 0	Fine weather, average speed 11 knots per hour.
	Malta to Alexandria ..	827	83 15	Fair weather.
Home.	Alexandria to Malta ..	805	93 30	Heavy head sea.
	Malta to Gibraltar	981	103 0	Fair weather.
	Gibraltar to Falmouth .	1,074	118 5	Heavy gales during three days.

Steamed, out, 2,885 miles, in 317 hours 40 minutes.
— home, 2,880 miles, in 314 hours 35 minutes.

Total distance .. 5,765 miles, in 632 hours 15 minutes.

Lowest average rate of speed from Falmouth to Gibraltar, violent gales, 7½ knots per hour. Highest average rate of speed, 11 knots per hour.

NOTES AND NOTICES.

Mechanical Chimney Sweeping.—By an act passed in the last session of Parliament, the employment of mechanical means for cleansing chimnies in future, seems to be pretty well provided for. In addition to other stringent clauses, it is enacted, that "from and after the 1st day of July, 1842, any person who shall compel, or knowingly allow, any child or young person under the age of twenty-one years to ascend or descend a chimney, or enter a flue, for the purpose of sweeping, cleansing, or coring the same, or for extinguishing fire therein, shall be liable to a penalty of not more than Ten, or less than Five Pounds."

The Blast in Iron-smelting Furnaces was originally produced by means of bellows; and so strong was the prejudice in favour of this method, that when the iron cylinders were first proposed it was with the greatest difficulty they obtained a trial; nor was it till after the lapse of several years that the "stubborn fact" of their producing twice the quantity of iron which had been ever reached by the old bellows, led to their universal adoption. The Tintern Abbey Works were the first at which cylinders were employed. The density of the blast furnished by the bellows rarely exceeded one pound on the square inch, but the increase through the employment of the cylinders is in some instances fourfold, and on the average more than double.—*Mechanics' Almanack.*

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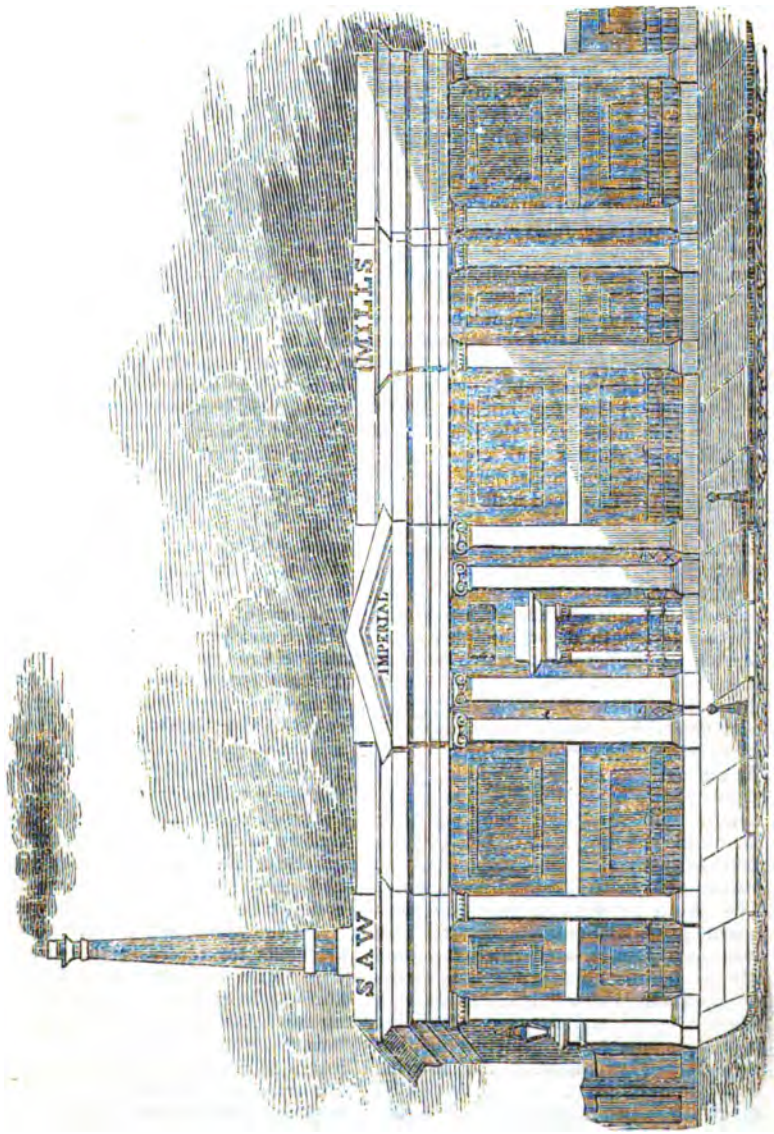


THE IMPERIAL SAW MILLS.

THE IMPERIAL SAW MILLS.

The Imperial Saw Mills, represented on our front page, have been recently erected on the west side of Wenlock-road, City-road, on the bank of the City Branch of the Regent's Canal. The building is of brick, upon a concrete foundation three feet thick, with an additional foot under the chimney shaft. The east front is of solid brickwork, with the exception of a central doorway; it is divided into a centre and two wings: the centre is ornamented with a bold plinth on which stand four Ionic pilasters, supporting an entablature and pediment of the same order. This entablature and plinth, which are cemented and admirably drawn and coloured to imitate stone, are continued round three sides of the building. The tympanum of the pediment and wings are lettered in raised cement characters of a large size; the two extremes of the wings are divided by composition pilasters, surmounted with caps, in which the architect has judiciously introduced the whole of the members of the Ionic order without the volutes and crown leaf, giving a uniform appearance to the whole front. The dead wall is relieved by a moulded string-course running all round the three fronts; between the plinth and string-course, and the string-course and entablature, double sunk pannels are introduced. Throughout the whole length of the building (190 feet) a handsome and massive bronzed iron railing is inserted. The centre doors have composite architraves, cornice, and tablet, supported by two trusses composed of the eye of the Ionic volute. At the extreme end of the south front, there are two neat counting-houses, connected with the main building by a handsome gateway, and brick piers finished with caps of Portland stone, surmounted with bronzed gas lamps. The south or working front, is composed of brick piers and cast iron sashes and frames, over which there is a row of dentills which gives a lightness of appearance and also tends to support the entablature and cornice. The west front is similar to the principal one, but without the pediment. The internal walls are quite plain, the building being divided into two distinct parts, communicating by iron doors fixed in stone door cases; the one part contains the steam-engine, boilers, &c., with adzing and glueing rooms over them; the other, containing the saws and machinery connected therewith. A very important feature about this building is the precautions that have been taken to prevent vibration; for this purpose, a projecting course of six inches of stone is carried round the whole of the building, on which the timbers of the floor are laid, and none of them are let into the walls. The whole of the machinery is supported upon brick piers, carried up from the foundation, and is quite independent of the flooring. The stability thus obtained, combined with the accuracy of the machinery, enables the proprietors to cut unusually thin veneers from the largest logs with great facility.

There is a principal chimney shaft 115 feet high, 20 feet square at the base, diminishing to 4 feet at the top, and finished with a composite moulded cap. The principal tie-beams are bolted into iron shoes, and connected with the caps of the iron columns, of which there are six in the mill-room, and three in the boiler-room; the pole plates forming the sides of a trough gutter. The mill-room, which is a lofty and well-lighted apartment, 80 feet long by 41 feet wide, contains six circular saws, viz. one of 7 feet diameter, two of 10 feet, two of 12 feet, and one of 17 feet, with driving, stopping, and reversing gear complete, all driven by one steam-engine of 60 horses power on the basement. There are three cylindrical steam-boilers, (by Horton, Bankside,) cased with ashes and patent felting, to prevent loss of heat by radiation. Connected with each saw is a traversing table, to which the wood to be cut is attached, and carried up to the saw by a rack and toothed gearing; lateral motion being given by two parallel screws placed one at each end of the table. The stays were cast upon the wheel, and ground very true; segments for receiving the saws were then fitted and ground, and the saws afterwards carefully fitted to these segments. All the parts of the machinery have been so nicely and accurately adjusted, that veneers of 14 to the inch are cut from the largest and hardest logs with the greatest ease. The saws make about 80 revolutions per minute, the logs advancing about 7 feet in that time.

Every precaution seems to have been adopted to guard as much as possible against the occurrence of accident: the chimney shaft is protected by an efficient lightning conductor, while that portion of the building where the presence of fire suggests the possibility of danger, is cut off by fire-proof communications from that which may be considered the more inflammable part. Gas is the only light permitted in the mill-room, and an elevated tank of water on the roof affords its additional protection against those accidents, to which less judiciously constructed buildings of this class have ever been so liable.

Notwithstanding the size of the saws, and the extent of the driving power, not the slightest vibration is perceptible anywhere; and the superior capabilities of these works promise soon to repay their enterprising proprietors, Messrs. Gabriel and Co., the immense capital expended in their construction.

The combinations of skill and taste—the strictly useful with the ornamental—which pervade this building, are highly creditable to John Combes, Esq., the architect; while the whole of the machinery presents equally unequivocal proofs of the engineering talents of Mr. Topham.

INSTRUCTIONS FOR BLASTING ROCK.

[We extract the following valuable information on this important subject from a paper of "Instructions for Blasting Rock in the Works of the River Shannon," recently issued by the Irish Board of Works, over which General Sir John Burgoyne presides with so much judgment and ability. Blasting, as ordinarily conducted, is a mere system of guess work, and, consequently, are of great waste; but here we have demonstrated, with all the precision of mathematical demonstration, how in every given case the greatest useful effect may be produced in the least time, and with the least possible expenditure of labour and materials. The "Instructions" from which we make these extracts will form, we understand, part of a much more extensive paper on Rock Blasting, which will shortly be published in the 4th volume of the Professional Papers of the Royal Military Engineers.—Ed. M. M.]

The charges of powder are not to be regulated in proportion to the depth of the hole bored, as is the common practice, but according *to the length of the line of least resistance*, or thickness of the rock to be blasted.

The line of least resistance will be the shortest line from the bulk of the charge of powder to the surface, if the mass exposed to the action of the explosion be of equal consistence throughout.

Charges of powder, to produce similar proportionate results, ought to be as the cubes of the lines of least resistance.

Thus, if 4 oz. of powder would just have a given effect upon a solid piece of rock of 2 feet thick, 13½ oz. would be required to produce the same effect upon a piece of rock 3 feet thick—that is,

	Cube of two feet, line of least resistance.		Charge in oz.		Cube of 3 feet.		Charge in oz.
As	8	is to	4,	so is	27	to	13½.

Or (which is the same thing) on that *particular datum*, the number expressing half the cube of the line of least resistance in feet, will be the charge in ozs. See the following Table, showing charges of powder for given lines of least resistance, calculated on this principle and on the assumed datum of 4 oz. for 2 feet:—

Lines of least resistance. Ft.	In.	Charges of Powder. Lbs.	Oz.	Lines of least resistance. Ft.	In.	Charges of Powder. Lbs.	Oz.
1	0	0	0½*	4	9	3	5½
1	3	0	1	5	0	3	14½
1	6	0	1¾	5	3	4	8¼
1	9	0	2½	5	6	5	3½
2	0	0	4	5	9	5	15
2	3	0	5½	6	0	6	12
2	6	0	7¾	6	3	7	10
2	9	0	10¼	6	6	8	9¼
3	0	0	13½	6	9	9	9¾
3	3	1	1	7	0	10	11½
3	6	1	5½	7	3	11	14½
3	9	1	10¼	7	6	13	8
4	0	2	0	7	9	14	8¾
4	3	2	6½	8	0	16	0
4	6	2	13½				

This datum will probably answer for most cases, but trials may be made of it in the commencement of any work, and a table drawn up accordingly; in the larger class of explosions, advantages may usually be taken of fissures in the

* In using so small a charge of powder as for 1 foot, a little excess is usually required, but ¾ oz. or 1 oz. will be sufficient.

rock, and other circumstances by which the charges may be greatly reduced.

It is useful at times to know the space in round holes that given quantities of gunpowder will occupy; the following Table will give the means of calculating them:—

Diameter of the Hole.	Powder contained in one Inch of Hole.		Powder contained in one Foot of Hole.		Depth of Hole to contain one lb. of Powder.
Inches.	lbs.	oz.	lbs.	oz.	Inches.
1	0	0·419	0	5·028	38·197
1½	0	0·942	0	11·304	16·976
2	0	1·676	1	4·112	9·549
2½	0	2·618	1	15·416	6·112
3	0	3·770	2	13·240	4·244

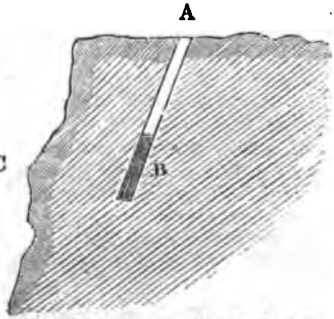
One pound of powder loosely poured, but not close shaken, will occupy about 30 cubic inches; a cube foot weighs about 57½ lbs.

To obtain the full effect of any charge of powder, the line of least resistance, if it be practicable, should not be in the direction of the hole bored.

Thus, if A B, fig. 1, be a hole bored in rock, it should be of such depth and direction that the explosion may find least resistance towards C, and not towards A; B C is then the line of least resistance, and the charge of powder at B will be 4 oz., or 13½ oz., or 2 lbs., according as the thickness B C shall be 2, or 3, or 4 feet, and not in any respect according to the depth of the hole A B. For instance, if B C be 2 feet, the charge at B should be 4 oz., whether the hole A B be 3, 4, or 5 feet, or any other depth.

Fig. 1.

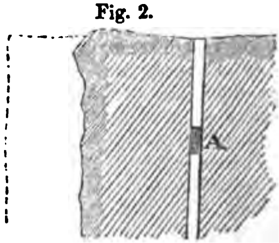
A

C  B

It is a difficult question to fix precisely the extent of tamping necessary to force the effect of the explosion in a direction different from that of the hole bored. That extent will be by no means necessarily in a constant ratio with the distances in other directions to the surface, but is dependent also upon other circumstances.

In small blasts (of 2 or 3 oz. for instance) the charge, not being out of proportion to the diameter of the hole, may find a ready vent if the tamping be not considerable, just as in firing a gun; while larger explosions are so far impeded in forcing their way through the small opening occupied by the tamping, as necessarily to produce a great pressure in all directions; thus a charge of a few oz. at A, fig. 2, might blow out the tamping above it, producing at the same

Fig. 2.

C  A

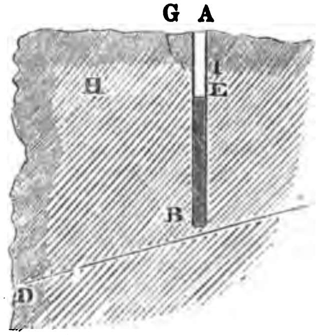
B

time very little effect on the rock; while the same degree of tamping, or a very little more, might resist a much larger charge prolonged to B, although it had a proportionate line of least resistance to C, more particularly if there be any fissures in the rock, or other circumstance to assist in its rupture; for the instant

the rock is opened, the effect of the explosion on the tamping appears practically to cease.

The following strong instance of this actually occurred in granite rock. A hole A B, fig. 3, of 3 inches diameter, was sunk down 11 feet deep, very near to a natural sliding joint C D. It was loaded with 19 lb. 12 oz. of powder, which occupied the space up to E, being 7 feet of the hole, leaving, consequently, only 4 feet for tamping; the explosion brought down the whole mass H, as was intended, leaving, however, a small collar A G I, 2 feet 6 inches deep, in which the tamping (of clay) remained undisturbed.

Fig. 3.

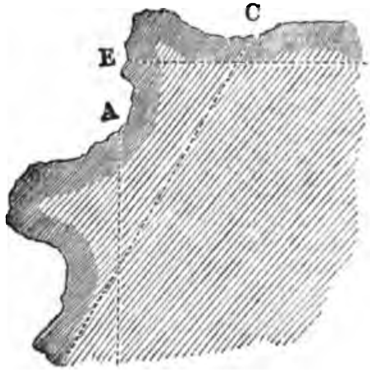


Although importance is attached to not having the tamping blown out, it is not meant that it may not be advantageous to let the shock reach the surface from which the hole was bored; on the contrary, it is desirable that it should do so, as thereby another face for the extension of the effect of the explosion is afforded, instead of its action being confined to one, which, for reasons explained in connection with figures 13, 14, 15, and 16, is the least advantageous.

As rock is usually of very irregular form, where the mass is extensive, as in a quarry, an endeavour should be made to obtain an exposed face tolerably even, either vertical, inclined or horizontal, as A B or C D, or E F fig. 4, then by boring holes parallel to such face, the charges can be better proportioned and adjusted, than when working on very uneven surfaces, and their effective action considerably increased.

When the rock is stratified, and in close beds and seams, as in fig. 5, the holes should be bored in the direction of

Fig. 4.



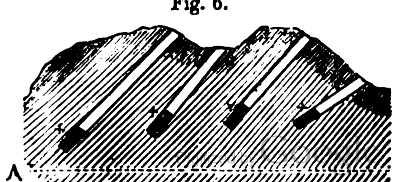
the joints, or parallel to them, and the surface to be lifted laid bare, which will give more effect than if the charge be placed across the grain, and the operation of boring will be more easy.

Fig. 5.

In many cases, particularly in clearing away small masses of rock, the position of the charges cannot be arranged in the most perfect manner, still much may be done by bearing the true principles in mind; the explosion should still as much as possible be forced through the solid rock and not by the side of the hole bored, and the length of the line of least resistance should be determined as well as the circumstances will admit.

Suppose it be required to cut down projecting rocks to the lines A B or C D, for a road or canal, &c.—(see fig. 6)

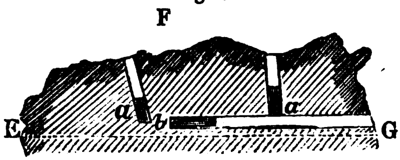
Fig. 6.



much of it may be done by successive charges placed as at *x x x x*, with a great deal more effect than by the usual manner of boring straight down.

Suppose again, a rock of the form A B C D fig. 7, (of which E F G is a cross section,) say, 12 feet long by 3 feet 6 inches deep, which is to be cut down to the line E G: the ordinary manner of proceeding would be by three or four holes *a a a*, vertical or nearly so, whereas the one *c*, *b*, would no doubt be far more efficient and economical.

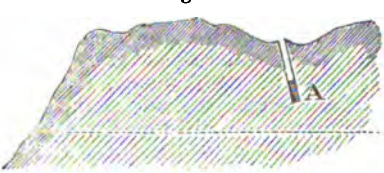
Fig. 7.



Whether the explosion is to be in the direction of the hole bored or not, still the same law must be attended to of proportioning the powder by weight, according to the cube of the length of the line of least resistance, and not according to the depth of the hole. The following example will show how erroneous it is to proportion the charges by the depth of the hole.

Suppose the hole A, fig. 8, to be 3 feet deep, and a charge be applied of *one-third of its depth* (an usual proportion) it may be a matter of chance whether this hole be 1 inch or 1½ inch bore, whereas the charge in the latter case will be *more than double* what it would be in the former, which is manifestly absurd.

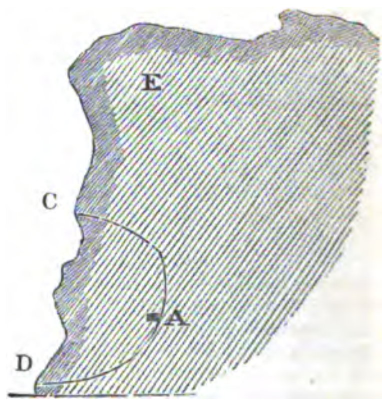
Fig. 8.



In small charges, more powder is commonly used than is necessary; whenever a loud report is heard, or fragments of stone are thrown out into the air, the system pursued whether necessary or not, has not been advantageous; when the best effect is produced the report is generally trifling, but the mass is seen to be lifted and thoroughly fractured without the projection of stones;—it may be observed that though the rock be not apparently fractured by any blast, the explosion will have had *some* useful effect, *provided it has not found its entire vent from the hole bored*, and a second shot from the same hole will be found very effective.

Where there is a high face of rock a system of undermining may be advantageously employed, thus, by a blast at A, fig, 9, an opening may be made from C to D, and the mass E, if not shaken so as to be worked by crow bars or wedges, will be easily brought down by slight subsequent blasts.

Fig. 9.

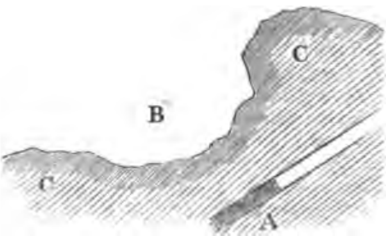


The worst situation for a charge of powder is in a re-entering angle, as at A in the horizontal section, fig. 10. The rock there exerts such pressure all round it, that very little effect can be expected; nor is its position much improved at B.

Fig. 10.

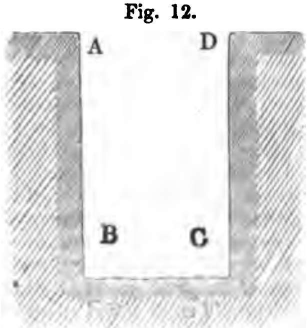
This situation occurs very frequently and should be avoided as much as possible. Thus, a charge at A, fig. 11, would have a line of least resistance to B, but the force of the explosion would be greatly reduced by the masses C C, and the charge must be increased accordingly.

Fig. 11.



This inconvenience is strongly exemplified in cutting through any narrow confined space, A B C D, fig. 12, such as in sinking a shaft or making a small gallery; blasts at E and F must be very disadvantageous, and the result, as experience has shown, slow and expensive.

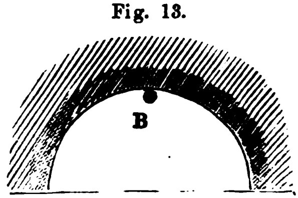
Fig. 12.



The next most unfavourable position, is when there is only one even face exposed: the best mode of operating in such a case is, if practicable, to bore the blasting holes, at the back of or under, and in either case parallel to that face, either vertically, inclined, or horizontally, as the case may be, and proceed as shown in fig. 1.

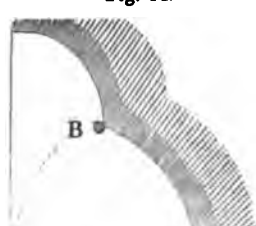
The most favourable position of all is in a projection, and the advantages are greater, in proportion to the number of faces to which the action of the blast can be extended, thus, A B C D, figs. 13, 14, 15, and 16, (viewed in plan) being holes sunk to such depth as to cause the explosion to find vent at the side, it will be seen by the blank spaces, showing the assumed effect, how the result is increased with the same expenditure of powder and labour by the greater number of faces exposed, or within reach of the effect of the explosion; the advantages, however, would be even more than appears by these figures, because at B, C, and D, the effects of the explosion would extend farther in the direction of the exposed sides, than where closely bound laterally as at A;—that is, smaller quantities of powder would answer for equal lines of least resistance, in the cases shown by figs. 14, 15, and 16, than would be required in the case shown by fig. 14.

Fig. 13.



With regard to the practical mode of working, it is not considered necessary here to advert in detail to the tools to be used in boring the holes, or the best mode of preparing them, as these are subjects very generally understood, but it may be well to observe that every means consistent with the execution of the greatest quantity of work in a given time, should be resorted to, in order to lessen, by the use of good materials,—by good workmanship, and the best application of both,—the great consumption of iron and steel which usually takes place in works of this kind.

Fig. 14.



Much good may also be done by carefully adjusting the weight of the hammers or sledges to the length of the jumpers and diameter of the bits used in boring the holes, and generally, it will be desir-

able to observe how far any alteration in the form, weight, or application of these tools tends to increase the quantity of work done by the same men in any given time.

Fig. 15.

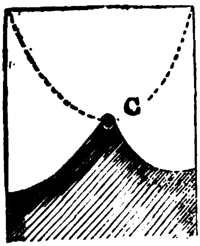
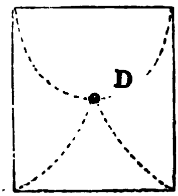


Fig. 16.



For loading correctly, with safety, despatch and with economy of powder, the miners should be provided with copper measures, tubes and funnel, by means of which, any quantity of powder may be introduced, and made to pass clear down to the end of the hole without a possibility of leaving any hanging on the sides to be wasted or to occasion accident.

When the holes are horizontal, or so nearly so that the powder will not run down, it must be pushed through the tube with a wooden ramrod or made up in cartridges and passed into the hole.

The powder may be taken out to the works in copper canisters, properly prepared for use, as well as for security against loss, accident or wet.

The safety fuse, for firing the charge, is to be employed on all occasions.

A piece of fuse is to be cut off by measurement according to the depth of the hole and the charge, so that an inch or two may remain above the mouth of the hole; it is to be then straitened and inserted with care after *part* of the powder has been put in, so that its end may be well buried in the charge; the principal precautions necessary are, that it does not by any curve catch on the side of the hole, and so, by doubling up, fail to reach the charge; and that in the tamping, particularly at its commencement, the fuse does not get drawn out of the charge: by being careful in these points, there will very seldom be a failure or miss-fire; should a miss-fire occur, however, the tamping is not to be bored out again, as it is a very dangerous practice. *See Appendix, for further directions for using the Safety Fuse.*

For tamping, the best material, as well for efficiency as for safety, is dried clay, and as there are very few districts of country where it is not easily to be obtained, it is that which is recommended to be generally used.

The clay may be rolled into cylindrical pieces of two or three inches diameter, into round balls, or into any other form found convenient, and dried at the fires of the smith's forges;—the drier it is the better, provided it be not too much so to remain caked, if so dry as to fall into powder it is not so efficient.

The next best material is chips and dust of broken brick, which should be moistened with a very little water while being rammed.

Loose sand is thoroughly inefficient; and quarry rubbish or chips and dust of the stone itself (being that which is commonly used) should never be employed, on account of its liability to accident, even although not of kinds that usually strike fire; it is also apt in being rammed to cut the fuse.

After the fuse and the whole of the charge have been introduced and the tubes withdrawn, an inch or two of the tamping is simply *pressed down* over the usual wadding of hay, moss, or dry turf, &c., with the tamping bar, before any hard ramming is commenced as it is usually at the first few blows of the ramming that accidents take place; the powder having been thus introduced with the tubes, and the wadding and a few inches of tamping pressed upon it, the hard ramming may then be undertaken with perfect security.

This partial looseness of the material near the powder will not only lessen the liability to accident, but tend to increase the effect of the explosion, as it is known that a slight hollow near the charge has that effect.

If these precautions are thoroughly attended to, and the resident engineers and overseers are particularly enjoined to see that they are never neglected, no accident by premature explosion can ever occur.

It will be the duty of the engineer to keep a detailed account of any accidents which may occur during the execution of the work, and having thoroughly in-

vestigated the cause of such accidents, to report them to the commisioners, and enumerate them in the general report hereinafter referred to.

Wherever there may be a necessity for blasting under water or in wet holes, the miners must learn how to prepare the water-proof bags or cartridges, and the mode of applying the particular fuse that is made for that purpose, called sump fuse, as well as the manner of tamping with sand and cones with wedges, where of sufficient importance, and that the clay cannot be rammed. The following is the mode of tamping referred to:—

Having placed the cartridge bag with the necessary quantity of powder therein and sump fuse attached, in the hole, a sufficient quantity of sand, or sand and clay, is to be poured in to fill the hole to within three or four inches of the top; a cast or wrought iron cone, having a groove to receive the fuse, is then to be let into the hole, and secured therein by means of three or more (according to the diameter of the hole,) wrought iron arrows of about three-eighths of an inch diameter, used as wedges—a piece of rope fastened to the cone is to be passed through the eyes of these arrows, and made fast to a piece of wood as a buoy to prevent their being lost upon the explosion of the charge. The resistance offered by the cone, if properly secured, will be found generally sufficient to prevent the escape of the charge through the hole, its effect in this respect will be improved by having a wadding of hay, grass, or other fibrous matter on the sand under the cone. *(See the Appendix for a further account of blasting under water.)*

APPENDIX.

Extracts *from papers published by Messrs.* Henry, Mullins, *and* M'Mahon, *relative to the use of Patent Fuse.*

Directions for using the Miners' Fuse, or Safety Rod.

The following directions will be found sufficient to enable persons acquainted with blasting, to use the fuse with convenience and safety:—

I.—Let it be used solely for the purpose of blasting, and not to bind up tools, or to serve instead of cord for any purpose whatever.

II.—Let it be kept in a place that is tolerably dry until wanted for use; it is believed, that if the fuse be suffered to remain a considerable time in very damp or mouldy places, it may be injured fully as much as if it had been all the while kept in water.

III.—Those men who work in very wet places should ask for *Sump Rods* of the person appointed to deliver the materials, as these are intended expressly for that purpose.

IV.—There should, in all cases, be some powder put into the hole before the fuse, that the fire may be certainly communicated to dry powder.

V.—Before the fuse is placed in the hole, the outside or countering-thread should be stripped down about an inch at the upper end. This will make it take fire sooner, and lessen the quantity of smoke, which will be an advantage. The fuse will take about half a minute to burn a foot in the open air, but a little more time should be allowed it when tamped.

Extract *from a paper by Messrs.* Henry, Mullins, *and* M'Mahon, *relative to the use of Patent Safety Fuse, or Sump Fuse, in Blasting under Water and Damp Places.*

The application of the patent safety fuse renders the operation of blasting rocks under water greatly more facile, expeditious, cheaper, and, beyond all comparison, less hazardous than the process heretofore in use. Indeed, it is barely possible that an accident can occur in using powder for the purpose of blasting, to the explosion of which the safety fuse is applied. The former practice of charging, in a tin cylindrical tube, inserted in the hole previously drilled in the rock (the depth and diameter of which was proportioned to the site, quality, and magnitude of the rock), so as to receive a sufficient quantity of powder, lodged at such a depth in it, as to produce upon ignition the effect sought, was obviously bad. The tube containing the charge was put into the hole from the diving bell, its length being adapted to the height from the bottom of the hole in the rock to the chamber in which the operations were carried on, a series of tubes, having water-tight joints, were then added, consecutively, the bell being elevated to adjust each successive joint until the final joint was carried a few inches above the surface of the water, when a small piece of red-hot iron was dropped into it, by

which the powder below was ignited. The process adopted at Kingstown is to charge the hole (drilled as before) with a water-proof cartridge, into which one end of the sump fuse is inserted; the hole is then tamped (wadded in the usual way), and a length of fuse appended sufficient, while it is burning to the charge, to admit the bell being moved *laterally* out of the perpendicular line of the explosion; the length of the fuse being accordingly adjusted, a fire is struck with flint, steel, and match-paper, and set to the fuse, which, when lighted, is thrust out under the mouth of the bell, to prevent its being filled with smoke; *and so left to burn its way, through the water, to the charge in the rock.* In the interim the signal is given for moving the bell a few feet out of the line of the fire; the fuse burning at the rate of 3 fect a minute. A piece of 4, 5, or 6 feet at most, in length, will afford sufficient time to place the bell in the required position. The blasting now performed at Kingstown, in the preparation of the foundation of the wall of the new Commercial Wharf erecting there, is in 22 feet water, at low water of spring tide.

The advantages arising from the use of the safety fuse in these operations, independently of the security it affords against premature explosion and consequent hazard of loss of life or limb, are obviously of great importance.

Firstly—The charge being tamped in the ordinary way, produces a considerably greater effect from a lesser quantity of powder than if placed in the tube, which does not admit of tamping, being open to the top, to receive the fire; thus a saving in the article of powder is made, and more work done at less cost.

Secondly—Whatever the depth of the water may be, five or six feet length of fuse will be sufficient for each shot, whilst the length of tube required must necessarily exceed the depth of water, which at Kingstown, according to the time of the tide, is from twenty-two to thirty five feet.

Thirdly—The fuse is much cheaper than the tubing, the greater part of which (the tubing) is destroyed by each shot.

Fourthly—In using the fuse the bell need not be raised to a greater height that at which it rested during the drilling, charging, tamping, and firing the hole; with the tube, the bell, five tons weight, must be raised entirely out of the water before the fire can be communicated, whilst in the former case it is merely pushed horizontally a little out of the line of the fire, and in a few minutes, four or five at most, it is restored to its birth to quarry and load in the bucket the ruptured rock, or to prepare for another shot, as the case may be. In this particular instance alone considerable time and labour is saved.

The fuse is not less efficacious in its application to powder used in blasting in wet quarries above ground. Heretofore much time and labour were lost in staunching, as it is called, wet holes in rocks so situated. A rock might appear wholly free from water until bored, when the hole serves as a conduit to discharge the water filtered into it through the water joints in the rock; when this happens, which is a very common case in most quarries, the hole must be dried or abandoned, the drying or staunching frequently miscarries, so that a re-bore becomes necessary, in which case great hazard is incurred, time, labour, and powder lost, all of which are obviated by the water-proof charger and fuse; so that in any way that it is applied to the purpose of blasting, it is an invention conferring great benefit on the community at large, particularly upon the working classes, whose condition in earning their daily bread exposes them to imminent peril in such hazardous undertakings.

The water-proof charger must be made of canvas or sail-cloth, into a bag of the diameter of the hole, and of a sufficient length to contain the requisite quantity of powder; one end of the sump fuse, unravelled for about half an inch, is then to be inserted in the neck of the bag, and tied with a strong thread. The bag, thus prepared, is to be twice or thrice dipped into boiled tar, when it is fit for use.

INSTITUTION OF CIVIL ENGINEERS. — TELFORD PREMIUMS.

The Council of the Institution of Civil Engineers have awarded the following TELFORD Premiums, for the present year, 1840:—

A Telford Medal in Gold to Josiah Parkes, M. Inst. C. E., for his two Papers "On Steam Boilers," and "On Steam Engines,

principally with reference to their Consumption of Steam and Fuel," published in the 1st and 2nd Parts of vol. iii. of the Transactions.

A Telford Medal in Silver, and Books, suitably bound and inscribed, of the value of ten guineas, to James Leslie, M. Ins. C. E., for his "Account of the Works of Dundee Harbour," with Plans and Drawings of the Works and the Machinery employed there.

A Telford Medal in Silver, and Books, suitably bound and inscribed, of the value of five guineas, to Robert Mallet, Assoc. Inst. C. E., for his Paper "On the Corrosion of Cast and Wrought Iron in water."

A Telford Medal in Bronze, and suitably bound and inscribed, of the value of three guineas, to Charles Bourns, Assoc. Inst. C.E., for his Paper "On Setting-out Railway Curves."

A Telford Medal in Bronze, and Books, suitably bound and inscribed, of the value of two guineas, to Henry Chapman, Grad. Inst. C. E., for his "Description and Drawings of a Machine for describing the Profile of a Road."

A Telford Medal in Bronze, and Books, suitably bound and inscribed, of the valve of two guineas, to Heary Renton, Grad. Inst. C. E., for his "Description and Drawing of a Self-acting Wasteboard on the River Ouse."

Books, suitably bound and inscribed, of the value of five guineas, to Eugenius Birch, Grad. Inst. C. E., for his "Drawings and Description of the Machine for Sewing Flat Ropes, in use at Huddart's Rope Manufactory."

Books, suitably bound and inscribed, of the value of two guineas, to T. J. Maude, Grad. Inst. C. E., for his "Account of the Repairs and Alterations made in the Construction of the Menai Bridge, in consequence of the Gale of January 7th, 1839.

Books, suitably bound and inscribed, of the value of two guineas, to Andrew Burn, Grad. Inst. C. E., for his Drawings of a "Proposed Suspension Bridge over the Haslar Lake."

Telford Premiums for 1841.

The Council of the Institution of Civil Engineers give notice that they will award, during the ensuing Session, TELFORD Premiums to Communications of adequate merit on the following subjects:—

1. An Account and Drawings of the original construction and present state of the Plymouth Breakwater.
2. The alterations and improvements in Blackfriars Bridge.
3. The recent repairs to the Eddystone Lighthouse.
4. On the best Gauge for the width of Railways, with the result of the experience of existing Railways.
5. On Stone Blocks and Timber Sleepers, or Sills, with and without continuous Timber Bearings, as foundations for Rails.
6. The ratio, from actual experiment of the Velocity, Load, and Power, of Locomotive Engines on Railways, with the resistance to progressive motion at different velocities.

   1st. Upon Levels.

   2nd. Upon Inclined Planes.
7. A Statement of the Cost of Transport on Railways in Great Britain by Locomotive Engines, including the repairs, maintenance of way, and all incidental expenses.
8. Ditto by Stationary Engines, on levels or on inclined planes, including all repairs, maintenance of way, and incidental expenses, with Drawings and Description of the Engines and Machinery.
9. The causes of, and means of preventing, the Priming of Steam Boilers.
10. The quantity of Water evaporated from Steam Boilers during experiments of not less than 12 hours' duration, if possible; including the consumption of fuel, its nature, the form and dimensions of the boilers and grates, the surfaces exposed to heat, their material and strength, and any other particulars.
11. The quantity or weight of Water consumed as Steam by any kind of Steam Engine, in the production of a definite effect; with an account and Drawings of the Engine, nature of the load, and methods employed to ascertain the absolute and useful effect of the Steam.
12. The best description of Meter for registering accurately the quantity of Water used for Steam Boilers, or other purposes.
13. The explosion of Steam Boilers; especially a record of facts connected with any explosions which have taken place: also, a description, drawings, and details, of the Boiler, both before and after the explosion.
14. Drawings, Sections, and Descriptions, of Iron Steam Vessels.
15. The comparative advantages of Iron and Wood as employed in the construction of Steam Vessels.
16. On the various kinds of Sheathing employed in the protection of Vessels, and their relative advantages.
17. Drawings and Descriptions of the Engines, Boilers, and general construction of Steam Vessels of the largest class, with a comparative tabular Statement of the dimensions of the parts of Engines of different powers, and their effect compared with that of smaller Engines.
18. On the use of high-pressure Steam on board Steam Vessels, with drawings and description of the Boilers.
19. On the best relative sizes of Steam Vessels of all classes in comparison with their Engine Power; illustrated by reference

to Steam Vessels already constructed, and giving their size, tonnage, speed, consumption of fuel, &c.

20. On the best application of different kinds of fuel under the Boilers of Steam Engines, especially with reference to obtaining perfect combustion, illustrated by drawings of the Boilers.

21. On the application of the Screw to propelling Vessels, and a comparison between it and the common Paddles.

22. Common Sewers in cities: the rules for and details of their construction.

23. Drawings and Description of the Outfall of the King's Scholar's Pond Sewer.

24. Drawings and Descriptions of the Sewerage under the Commission for Regent Street, especially of the Outfall at Scotland Yard.

25. Plans and Sections of Blast Furnaces, with the necessary Mine Kilns, Hot-Blast Stoves, and general arrangement of an Iron Work, with a description.

26. The comparative advantages and disadvantages of Hot and Cold Blast in the manufacture of Iron, with statements of the quality and quantity of materials employed, and produce thereof.

27. An Account of the various methods lately employed for preserving Timber from Dry Rot and other sources of decay; with the results of experience as to the kinds of Timber most applicable for Engineering works, and other situations where speedy destruction at present occurs.

28. A Memoir of Sir Hugh Middleton, with an Account of his Works.

29. A Memoir of Arthur Woolf, with an Account of his Works.

30. A Memoir of Jonathan Hornblower, with an Account of his Inventions and Works.

31. A Memoir of Richard Trevithick, with an Account of his Inventions and Works.

32. A Memoir of William Murdoch (of Soho), with an Account of his Inventions and Works.

The Communications must be forwarded to the House of the Institution, No. 25, Great George Street, Westminster, on or before the 31st of May, 1841.

The Committee state that it is not their wish to confine the TELFORD Premiums to communications on the above subjects; other communications of acknowledged merit, and peculiarly deserving some mark of distinction, will be rewarded.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM SOUTHWOOD STOCKER, BIRMINGHAM, *for certain improvements in machinery applicable to making nails, pins, and rivets.*—Enrolment Office, Dec. 2, 1840.

Upon a strong frame, a cranked axle is mounted, furnished with pullies for receiving motion from a steam-engine or other prime mover; four iron bars slide horizontally backward and forward in a suitable frame, by means of a connecting rod from the crank shaft; these bars are fastened at one end to a plate and work through another furnished with suitable openings. In these horizontal bars others are placed which have a motion at right angles to them; these bars carry the forging tools, consisting of rollers, either grooved or plain, according to the nature of the work to be produced. The opposite ends of the latter bars or tool-holders, are furnished with anti-friction wheels, which act against inclined planes, for the purpose hereafter stated. A pipe or tube lays horizontally along the machine, its end reaching nearly to the position of the forging tools; through this tube the workman introduces a rod of the metal to be forged, the motion of the crank draws the sliding bars inwards, when the anti-friction wheels coming in contact with inclined planes, the forging tools are brought together upon the hot iron, which is worked to the size and shape required. By this means a square, angular, or cylindrical bolt can be produced of any required length or size, with a head of any determined shape, so as to produce spikes, bolts, rivets, &c., with great facility and precision. The stem of the bolt, &c., being forged, is to be finished by a heading machine, of which two forms are described. In the first there is a pair of shears worked by cams which cut off the stated lengths from a rod of metal. A cranked shaft works a heading die, which strikes the bolt as it lies in a suitable position for receiving the blow, in a hole of the proper size. A smaller hole is continued through, in which a small steel wire slides, being kept back by a spiral spring, but urged forward after the heading die has struck a blow, by the revolution of a cam driven by a bevil wheel from the crank shaft. In the other machine, which is intended for heading spikes, nails, &c., the arrangement is somewhat similar to the foregoing, but that the articles, instead of being placed in fixed permanent holders, are placed in grooved dies, one moveable the other fixed, which are laid into the machine and held securely by a lever and spring catch. A number of these moveable dies are used with the machine, so as to ensure a constant and rapid supply of the spikes, &c., in a hot state, to receive the blow which finishes the head.

The fourth part of this patent relates to the manufacture of cut brads and nails, the improvement consisting in turning the strips of metal by the motion of the machine itself, instead of by hand, as heretofore done. A pair of cutting shears are formed by two long cutters, the lower one being fixed, the upper

one rising and falling in guides by means of the alternating motion of a crank shaft. In front of these cutters a series of cylinders are placed at an angle with them; through an oblong hole in the end of each of these cylinders, a strip of metal of a breadth corresponding to the length of the nail to be produced, projects against a stop. On the end of each of these cylinders a pinion is formed, and takes into a rack which passes along beneath the whole series. On motion being given to the crank shaft, the moveable cutter descends, and cuts off an angular nail or brad from each strip of metal; a sliding movement is then communicated to the rack, which traverses so far as to turn the cylinders and strips of metal half round, when another cut is made, followed by a retrograde motion of the rack, by which means a series of angular pieces are continually cut from the metal strips. There is a contrivance for urging the strips forward to the cutters, but the turning of them between each cut is the principal novelty.

The claim is—1. The mode of combining the forging tools in a moveable frame, and means of causing such tools to approach each other and forge a length of iron properly held in a machine, whether for forging the stem of a nail, pin, or rivet, or for pointing the end thereof, as described.

2. The mode of constructing the heading and cutting machine as described. 3. The mode of applying moveable dies to a machine for heading pins, rivets, or nails. 4. The turning over by machinery, and cutting a series of plates or strips of metal in making cut nails.

Alexander Southwood Stocker, Birmingham, *for improvements in the manufacture of tubes for gas and other purposes.*—Enrolment Office, Dec. 9, 1840.

The improvements which form the basis of this patent are briefly the application to harder metals of the process long since employed for the production of leaden pipes. Short cylinders are cast of a thickness to be determined by the length and substance of the finished tubing that is required. The central aperture is produced in the cylinder by a sand or other core, of the same size as the bore of the tube to be produced, in the usual way of founding. A steel mandril is formed of the size required, slightly tapered (about one-sixteenth of an inch in eight feet); the metal cylinder being heated to a cherry red, the mandril is inserted, and the cylinder passed through a series of grooved rollers gradually diminishing in size, until the proper dimensions are obtained. The first portion of the patent relates to the production of brass tubing, composed of 60 lbs. of best copper, 40 lbs. of zinc, and 14 oz. of tin. The inventor states that this alloy answers very well for the purpose; other, proportions, however, may be used, care being necessary that the mixture is such as will admit of being rolled at the heat mentioned. The second part refers to the use of cast iron in lieu of brass. The cylinders of iron are cast as before directed, and are then subjected to an annealing process. For this purpose they are placed in a proper furnace, and surrounded with rich iron ore: the furnace is then closed and heated to a bright red for eight or more days, according to the thickness of the cylinders, by which time they will be rendered sufficiently malleable to undergo the process described.

The claim is—1. The mode of constructing tubes without seams, of a compound of copper and zinc, with or without tin, by elongating a bored or cast cylinder, while in a heated state. 2. The mode of producing iron tubes without seams, by elongating cylinders made of malleable cast iron.

Christopher Nickels, of York-road, Lambeth, Gentleman, *for improvements in the manufacture of braids and plaits.*—Enrolment Office, Dec. 9, 1840.

In order to form loops or fringed edges to the fabric produced, a stationary mandril or mandrils are applied to the axes of the revolving heads; the braiding threads pass round these mandrils in their evolutions, and are laid thereon. As the work is produced and carried up, it is drawn off these mandrils, so that while the one portion of the braiding threads are continually taken up and produce close braided or plaited fabrics, the rest are worked into loops, forming fringed edges thereto. The second improvement relates to the manner of combining a series of single braids or plaits so as to form one fabric. In the usual course, the fabric leaves the machine in a single complete braid or plait: by the arrangement now patented, the machinery is so contrived, that each set of threads passes into and takes hold of the adjacent set, and thereby produces a broad fabric of closely braided or plaited material.

The claim is, 1. The mode of making braids and plaits with fringed edges or parts, by means of mandrils. 2. The mode of manufacturing braids and plaits, by so arranging the parts of the machines, that the threads may work in sets, and the portions of the fabric produced by the several sets of threads be combined, without the thread passing from selvage to selvage, of a flat fabric, or without performing a continuous circle when working in a circular machine.

Robert Hampson, May-field Print-works, Manchester, Calico Printer, *for an improved method of block printing on woven fabrics of cotton, linen, silk, or woollen, or any two or more of them intermixed.*—Enrolment Office, Dec. 9, 1840.

The nature of these processes is such as to make it difficult, without the illustrative drawings, to give any more information respecting them than is conveyed by the following tolerably explicit claims.

1. The mode set forth of printing with blocks on woven fabrics of cotton, linen, woollen, or any two or more of them intermixed.

2. The combination of contrivances and agents whereby the printing block is caused to descend in a perpendicular direction, with its face parallel to the printing table, in order that it may take up the proper colour from the sieve or sieves, and then impress it upon the fabrics to be printed.

3. The same combination of contrivances or agents, however modified or altered in size, form, or position, yet producing the above effect.

4. The colouring apparatus as described, in which several sieves are separated and held apart, to admit of the separate colours being spread on them, and afterwards closed or brought into juxta-position, in order to print the desired pattern, composed of different colours, at the same time.

5. The colouring apparatus, either used in connection with the other machinery, or by itself.

Edward John Carpenter, Toft Monks, in the County of Norfolk, Commander in the Royal Navy, *for improvements in the application of machinery for assisting vessels in performing certain evolutions upon the water, especially tacking, veering, propelling, steering, casting or winding, and backing astern.*—Enrolment Office, Dec. 12, 1840.

These improvements are threefold, consisting in the first place, of a method of affixing and adjusting an improved propelling apparatus to vessels, so as to attain the greatest possible speed, with reference to the use of sub-marine rotary propellers on the quarter; Secondly, of a method of applying and adjusting the propelling apparatus so as to turn ships, &c., about in various positions without the assistance of the wind or rudder; and, thirdly, a method of applying a single propeller to the stem of ships or vessels. There are nine diagrams attached to the specification, elucidatory of the construction of the vanes, blades, or screws, which form the submarine quarter propeller, and without which it is difficult to convey a correct idea of their character. When any number of the planes or screws are set or affixed on a shaft, either oblique or vertical to the plane of the axis of that shaft, at the angle of 30° or between the angles of 20° and 45°, for the purpose of moving a vessel in or upon the water, by means of rotation, it is then called a "Propeller." Two spindles or axles to which the propellers are affixed, protrude thrsugh the vessel on both quarters, at a point near the line of flotation, below the load water line, and above the keel, between the midship section and the stern-frame. These spindles are enclosed by metallic cylinders or other proper packing, having a cup and socket valve and stuffing box at one or both ends; they are firmly secured to the timbers of a vessel by means of iron or other fastenings. That part of the spindle which is within the vessel, is to be connected to a steam-engine or other first mover by means of a connecting shaft, eccentric rods, bands, or other usual mechanical contrivances. The outer part of the spindle is connected with the propelling shaft, by means of a universal or other suitable joint; with a hinge or some equivalent contrivance, for allowing the propeller-shaft to be raised or detached; by means of a contrivance termed a "regulator." This consists of a rod furnished with a rack and pinion, with a pendant bearing attached to the propelling shaft at the bottom of the rod, through which bearing the shaft passes, so as to be raised or lowered, as circumstances may require. Or, the regulator may be formed of a chain and tackle. A metal stern bearing is bolted firmly into the transom or timbers of the vessel, so as to resist the force of heavy seas against the propeller, and also capable of being easily detached, as circumstances may require: two or more bearings may be thus applied, if required. The end of the propeller shaft may be coupled to the arms or supports of the bearing in such a manner, that the upper end of the propellers may be raised or lowered, as before described; but in either case the invention consists in projecting the means of raising or lowering a propeller of this description, at the same time securing to it an efficient bearing, without which such propellers would be impracticable for useful purposes.

The second part of the invention refers to a mode of communicating motion to the propellers from the capstan of a vessel: a bevelled wheel upon the capstan, acts upon two pinions connected with the spindles before described. After the apparatus has been coupled together, it is only necessary to turn the capstan round, and the vessel will be turned in an opposite direction to the line in which the force is applied, according to the position of the propellers, or whether one or both are used.

The third part consists of a mode of dividing the rudder, so as to allow the shaft of a single propeller to pass through it without interfering with its movements; and also in the form of the vanes or blades to be applied to such shaft, (of which there are four drawings), consisting principally of arcs or segments of a large circle,—the length of

each vane or blade being more than twice its radius. The outer segmental line is the arc of a circle of such a diameter, that every part of it will be equi-distant from the centre of the shaft, according to the angle at which it is placed: two of these blades are placed angularly upon the shaft, as before described with reference to the quarter propeller. The rudder is divided into two parts, connected together by a strong iron frame, which forms a slot for the propeller shaft to work through. The shaft is supported at its extremity by a hinged bearing, with a regulator or topping lift, for raising it out of the water.

The claim is, 1. The application or adaptation of submarine propellers in the manner above described, in whatever situation such propellers may be placed. 2. The peculiar form of the propellers, as shown in the drawings, in whatever way they may be used.

LIST OF DESIGNS REGISTERED BETWEEN NOVEMBER 30TH AND DECEMBER 23RD.

Date of Registration.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Dec. 1	485	C. Warne	Boot-makers' machine	1 years.
3	486	T. Horn	Mincing machine	3
"	487	G. Hyde	Envelope	1
4	488	T. Hopkins	Carpet	1
"	489	J. C. Bowles	Wafer	1
7	490	Buckley, Brothers	Gambroon	1
"	491	C. Stocken	Bottle stopper	3
"	492	Ditto	Envelope	1
8	493	H. D. Smith	Japanned baize	1
14	494,7	G. and H. Talbot and Sons	Carpet	1
"	498	T. Walker	Stove	3
"	499	J. and J. Walker	Cantoon	1
16	500	W. H. Phillips	Machine for improving draughts in chimneys, &c.	3
17	501	J. G. H. Rouketti	Barometer	3
18	502	Taylor, Brothers	Letter press	3
21	503	D. Smith	Hot gas burner	3
"	504	Lieut. Col. Baron de Berenger	Envelope	1
22	505	G. Clarke and Co.	Cantoon	1
"	506	D. Davies	Railway carriage break	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 27TH OF NOVEMBER AND THE 23D OF DECEMBER.

Miles Berry, of Chancery-lane, patent agent, for certain improvements in looms for weaving. Nov. 27; six months.

John Clay, of Cottingham, York, gentleman, and Frederick Rosenborg, of Sculcoates, in the same county, gentleman, for improvements in arranging and setting up types for printing. Nov. 27; six months.

John Condie, manager of the Blair Iron Works, Ayr, Scotland, for improvements in applying springs to locomotive railway and other carriages. Nov. 27; six months.

George Holworthy Palmer, of Surrey-square, civil engineer, and Charles Perkins, of Mark-lane, merchant, for improved constructions of pistons and valves for retaining and discharging liquids, gases, and steam. Nov. 28; six months.

George Blaxland, of Greenwich, engineer, for an improved mode of propelling ships and vessels at sea and in navigable waters. Nov. 28; six months.

Henry Bridge Cowell, of Lower-street, Saint Mary, Islington, ironmonger, for improvements in taps to be used for or in the manner of stopcocks, for the purpose of drawing off and stopping the flow of fluids. Dec. 2; six months.

James Robinson, of the Old Jewry, manufacturer of machinery, for a sugar-cane mill of a new construction, and certain improvements applicable to sugar-cane mills generally, and certain improvements in apparatus for making sugar. Dec. 2; six months.

Alexander Horatio Simpson, of New Palace-yard, Westminster, gentleman, for an improved machine or apparatus for working pumps. (A communication.) Dec. 9; six months.

William Peircé, of George-street, Adelphi, gentleman, for improvements in the preparation of wool, both in the raw and manufactured state, by means of which the quality will be considerably improved. Dec. 9; six months.

Charles Winterton Baylis, of Birmingham, accounting-house clerk, for an improved metallic pen, to be called the Patent Flexion Pen and improved Penholder. Dec. 16; six months.

George Wildes, of the city of London, merchant, for improvements in the manufacture of white lead. (A communication.) Dec. 16; six months.

James Davis, of Shoreditch, engineer, for an improved mode of applying heat to certain steam-boilers. Dec. 16; six months.

John Steward, of Wolverhampton, esq., for an improvement in the construction of piano fortes, harpsichords, and other similar stringed musical instruments. December 16.

James Molyneux, of Preston, for an improved mode of dressing flax and tow. December 16; six months.

Charles Botton, of Farringdon-street, gas engineer, for a certain improvement in gas meters. December 16; six months.

Hugh Graham, of Bridport-place, Hoxton, artisan, for a new mode of preparing designs and dyeing the materials to be used in the weaving and manufacture of Kidderminster carpets, and for producing patterns thereon, in a manner not before used or applied in the process of weaving and manufacturing such carpets. December 16; six months.

Joseph Beathie, of Portland-place, Wandsworth-road, Lambeth, engineer, for certain improvements in locomotive engines, and in carriages, chairs, and

wheels, for use upon railways, and certain machinery for use in the construction of parts of such inventions. December 16; six months.

Andrew Pruss D'Olszowski, of Ashley-crescent, gent., for a new and improved level for ascertaining the horizon, and the several degrees of inclination. (A communication.) Dec. 16; six months.

William Tudor Mabley, of Wellington-street North, mechanical draftsman, for certain improvements in producing surfaces to be used for printing, embossing, or impressing. Dec. 17; six months.

Abraham Alexander Lindo, of Finsbury-circus, gent., for improvements to be applied to railways and carriages thereon, to prevent accidents, and to lessen the injurious effects of accidents to passengers, goods, and railway trains. December 18; 6 months.

Elias Robison Handcock, of Birmingham, esq., for certain improvements in mechanism applicable to turn-tables, for changing the position of carriages upon railroads, for furniture and other purposes. December 18; six months.

Richard Coles, of Southampton, slate merchant, for improvements in machinery or manufacturing tanks and other vessels of slate, stone, marble, and other materials, and in fitting and fastening such materials together. Dec, 23; six months.

Benjamin Baillie, of Henry-street, Middlesex, for improvements in locks, and the fixings and fastenings thereto belonging. Dec. 23; six months.

John Brunmerell Gregson, of Newcastle-upon-Tyne, Northumberland, soda-water manufacturer, for improvements in pigments, and in the preparation of the sulphates of iron and magnesia. Dec. 23; six months.

Frederick Payne Mackelsan, of Birmingham, and James Murdoch, of Hackney-road, civil engineers, for certain improvements of or belonging to tables, a portion of which is applicable to other articles of furniture. (Partly a communication.) Dec. 23; six months.

George Thornton, of Brighton, civil engineer, for certain improvements applicable to railways, locomotive engines, and carriages. Dec. 23; six months.

John Dickinson, of Bedford-row, esq., for certain improvements in the manufacture of paper. Dec. 23; six months.

David Walther, of Angel-court, Throgmorton-street, merchant, for certain improvements in the methods of purifying vegetable and animal oils, fats, and tallows, in order to render those substances more suitable to soap making, or for burning in lamps, or for other useful purposes, part of which improvements are also applicable to the purifying of the mineral oil or spirit, commonly called petrollum or naptha, or coal oil, or spirit of coal tar. Dec. 23; six months.

John Jones, of Leeds, brush manufacturer, for improvements in carding engines for carding wool and other fibrous substances. (A communication.) Dec. 23; six months.

Joseph Barker, of Regent-street, artist, for improvements in gas meters. December 23; six months.

NOTES AND NOTICES.

Grease adapted to Carriages and Machines of all Sorts.—This composition prevents friction to a great extent, and of course lessens the wear of all rubbing surfaces. Its cost is not comparatively greater than the materials often employed for the purpose. It is not changed by heat, and hence does not liquify and flow away from its proper place.

Recipe.

Black lead, pulverized	50 parts, by weight.	
Hogs' lard	50	do.
Fresh soap	50	do.
Quicksilver	5	do.

At first amalgamate well the lard and mercury, by rubbing them together for a long time in a mortar. Then gradually add the black lead, and lastly the soap, mixing the whole as perfectly as possible.—*Rec. Soc. Polytech. Jan.* 1839.

Duck Paddle-wheel.—We copy the following from the *Argus*:—"A series of experiments have recently been tried in France by the Marquis de Jouffroy, with the view of getting rid of the inconveniences of the ordinary steam paddle. The apparatus of M. de Jouffroy consists of two palms, or articulated duck's feet, placed either at the sides or stern of a vessel, having an alternate motion, so as to open in order to give the impulsion, and close again precisely the same way as the foot of a duck. M. de Jouffroy's first experiment was made in the canoe of the Jardin de la Folia St. James, near the Bois de Boulogne, with the model of a frigate made on a scale of 1 foot to 37 feet, and so constructed that the common paddle or his improvement might be used at will. With the common paddle the vessel performed a distance of 130 feet in seven minutes. The paddles having performed 130 revolutions, at this time the propelling power was completely exhausted. The common paddles were then taken off, and the duck's-foot paddles substituted. With 130 oscillations of these paddles the vessel performed, in the same space of time, a distance of 153 feet; but what was most remarkable, was the fact that instead of stopping short when the clock-work (which in both cases put the machinery in motion) had run down, the impulsion communicated to the vessel by the steady and undisturbed motion of the duck's-foot paddles was sufficient to keep the vessel moving 150 feet more. The report of these experiments by the committee of the Institute is highly favourable."—A plan of a paddle-wheel, on precisely the same plan, was exhibited at one of the meetings of the Institute of Civil Engineers last summer by Henry Vint, Esq., of Colchester, the patentee of the bridle-paddle; and, if we mistake not, a drawing of it was deposited at the time, in the library of the Institution, and may still be consulted there.

Dr. Lardner's Steam-engine illustrated.—We have to apologise to our esteemed correspondent, "Trebor Valentine," for having overlooked his last communication, exculpating himself from the charge of "mis-reading" and "mis-quoting," brought against him by "Vulcan," at page 394. We had not the first number of the work at hand to refer to at the moment and the matter escaped our subsequent attention. We have now to state, that we have seen the edition referred to of Dr. Lardner's work, and that "Trebor Valentine's" quotation *is quite correctly given.* "Vulcan" seems to have overlooked the circumstance of "the seventh edition" only being called in question, and must take back to himself the designation of "*a most careless critic.*"

Errata.—Page 573, 1st column, 15th line from top, for "has been understood," read "has been underrated." Same page, 2nd column, 23rd line from top, for "connecting rod axis of the cylinder," read "connecting rod and axis of the cylinder." Page 588, 2nd column, supply the following line:—"provision on the part of man. The pre-". Page 592, 1st column, 3rd line from bottom, for "but now selected," read "but now patented."

END OF THE THIRTY-THIRD VOLUME.

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ENGLISH.